



UNITED STATES
MARINE CORPS

**VIRTUAL PRIME VENDOR
T1P1 SHORT TERM PROJECT**

- QLM/RETAIL at MCRD-SAN DIEGO -

ARN FINAL TECHNICAL REPORT

Period Covered - March 1997 to September 99.

Date Submitted: 1 October 1999

**Submitted by: Cal Poly
Co-Author: AdvanTech, Inc.**

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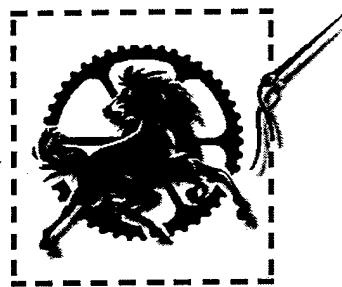
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ARN demonstration sites, Cal Poly and Clemson University, were directed to develop Virtual Prime Vendor (VPV) demonstrations. The Cal Poly ATRC VPV initiative focused on support and collaboration with MCRD-SD and its supporting supply chain entities. The VPV scope was to address all components of the military recruit apparel supply chain including manufacturing, wholesale and retail to enhance asset visibility and management at each level. The objectives included developing and implementing an integrated supply-chain system providing total asset visibility coupled with balanced manufacturing flows and replenishment/inventory management systems to achieve significant retail and wholesale inventory drawdown.

This short-term project has resulted in the implementation of the Quality Logistics Management system at MCRD-SD and was funded to provide automated support for logistics operations at the retail level including key functional components that support supply requisitioning, receipt processing, inventory management and supporting and tracking customer issues.

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1.0 EXECUTIVE SUMMARY

This project was part of the Defense Logistics Agency (DLA) Apparel Research Network (ARN) Virtual Prime Vendor (VPV) initiative. The overall objectives for the military customer, the Defense Logistics Agency (DLA)/Defense Supply Center Philadelphia (DSCP) and the commercial manufacturers in the supply chain have been to reduce inventory and costs while improving efficiencies. The objectives for the ARN VPV activities include process and technical improvements in the entire government supply chain. This project report specifically documents this Cal Poly VPV T1P1 project conducted as a short-term project (STP).

As part of the ARN VPV initiative, the Cal Poly Apparel Technology & Research Center (Cal Poly Demo) was assigned to work with the US Marine Corp Recruit Depot - San Diego (MCRD-SD), in the design, development and implementation of a new inventory and order management system that would provide enhanced management capabilities, create asset visibility and support the balanced flow concepts of the Virtual Prime Vendor initiatives. The process resulted in selection of the Quality Logistics Management™ (QLM/Retail) software for installation and modification to support management and operational requirements at the RTC retail level. As a result of this project and the capabilities provided by the QLM/Retail software, MCRD-SD established new inventory targets as part of an inventory draw-down process, was able to achieve the target inventory levels at the beginning of the fiscal year and have maintained that level of performance since then. Current results for MCRD-SD show achievement of reduction/draw-down of inventory *in excess of \$4,000,000* – over 50% – since the Quality Logistics Management™ software became fully operational in May 1998.

In addition to installation of QLM at MCRD-SD, the Cal Poly Demo Project Team worked on the ARN Asset Visibility System (AAVS) and the Automated Supply Apparel Processing (ASAP) Internet Web based capability. These components of the project were developed for use by the DSCP item managers to enhance management of the entire government Clothing & Textile (C & T) supply chain. The AAVS tool allows the DSCP item manager to view Standard Automated Materials Management System (SAMMS) data, customer data and manufacturer's data simultaneously - a capability previously not available. The ASAPWeb tool is the mechanism by which the manufacturer provides visibility to the DSCP of their work-in-process and finished goods inventory - another capability previously not available.

The last part of this project included conducting a feasibility study at the US Army's Ft. Leonard Wood (FLW) Recruit Training Center and Clothing Initial Issue Point (CIIP) to determine the potential to implement a QLM-type system for achieving inventory reductions and providing asset visibility at an Army Recruit Training Center. This feasibility study included determining whether DLA/DSCP could assume ownership and management of the inventory at this base. Alternative courses of action to satisfy DSCP objectives were identified in the feasibility study presented to DSCP personnel in October 1998 (see attached "Ft. Leonard Wood Recruit Induction Center Clothing Initial Issue Point Site Visit Review & Alternatives Evaluation" prepared by an ARN Team dated October 15, 1998). As a result, QLM/Local (for wholesale inventory management) is now being installed at this site to provide support and achieve similar successes at Ft. Leonard Wood as those achieved at MCRD-SD.



2.0 INTRODUCTION

2.1 Apparel Research Network & Virtual Prime Vendor Initiative

The purpose of the ARN is to develop an apparel manufacturing research agenda through a strategic planning effort and to conduct research projects that improve the domestic manufacturing industry's ability to produce military apparel "better, more economically and faster." To accomplish these research efforts and objectives, the Defense Logistics Agency (DLA) solicited proposals from businesses and academic institutions in 1994 to establish a "partnership" to identify emerging industry capabilities and to evaluate through demonstration projects the benefits that could be achieved from the adaptation of new and improved methods to support the DLA's requirements for military apparel.

As a result of the request for proposals, DoD DLA selected 23 ARN partners including 12 academic institutions and 11 businesses. Cal Poly is the only West Coast academic institution in the ARN. The proven benefits of all research work will be implemented in industry to improve the DLA's ability to provide apparel products to the military services in a "Quick Response" mode providing quality support for on-going requirements while at the same time providing the ability to reduce inventories throughout the Defense Logistics Agency supply chain from the point of manufacture to the point of retail issue.

The Virtual Prime Vendor initiative began in February 1997 when the ARN demonstration sites (Cal Poly and Clemson University) were directed to develop Virtual Prime Vendor (VPV) Demonstrations. The Cal Poly ATRC VPV initiative focused on support and collaboration with MCRD-SD and its supporting supply chain entities. The VPV scope was to address all components of the military recruit apparel supply chain including manufacturing, wholesale and retail to enhance asset visibility and management at each level. The objectives included developing and implementing an integrated supply-chain system providing total asset visibility coupled with balanced manufacturing flows and replenishment/inventory management systems to achieve significant retail and wholesale inventory drawdown.

Central to the success of the VPV initiatives was the development of the ARN Asset Visibility System (AAVS) with its associated single information hub, the DataMart. This system is the foundation for providing the supply chain managers, as well as all the participants in the supply chain, with near real-time visibility of current status and/or historical information to support improved forecasting, analysis, and ordering decisions along with improved procurement actions. The short-term project resulting in implementation of the Quality Logistics Management system at MCRD-SD was funded to provide automated support for logistics operations at the retail level including key functional components supporting supply requisitioning, receipt processing, inventory management and supporting and tracking customer issues. In addition, QLM provides automated interfaces to legacy systems for order tracking and financial reporting and the predictive forecasting capabilities use balanced inventory flow concepts to meet seasonal fluctuations effectively.



2.2 Cal Poly Demo & the Apparel Technology and Research Center

The California apparel manufacturing industry represents the largest geographic segment of the US industry and the ATRC is the only facility of its kind servicing industry on the West Coast. The California State Polytechnic University (Cal Poly) Apparel Technology & Research Center (ATRC) was established in 1992. The ATRC is an outreach program designed to work directly with people and companies in the domestic apparel industry to increase their competitiveness. In particular, program functions include guidance and direction in how to become a military contractor.

In December 1994, the ATRC was awarded a partner contract in the Department of Defense -Defense Logistics Agency Apparel Research Network (ARN). In December 1995 the ATRC received the ARN Demonstration delivery order. The Demo effort includes the operation of a factory, an outreach education program, an industry Coalition and a variety of information and resource services (see inside). The ARN demonstration effort is focused on technology transfer to the apparel industry. The Demonstration contract is for seven years and totals up to \$12.5 million for all components.

2.2.1 Apparel Technology and Research Center Demonstration Showcase

The Cal Poly Apparel Technology and Research Center factory is a showcase demonstrating apparel manufacturing technology and advanced systems. The ATRC factory shows use of apparel manufacturing technology at varying levels of automation and computer assistance. Technology in the ATRC factory was chosen in light of the nature of California apparel manufacturing businesses and the products they produce. The Center houses a model manufacturing facility, an outreach education program and additional resources to serve the needs of the apparel industry. Through its research, demonstration and education/training programs, the Cal Poly ATRC assists apparel companies of all sizes in identifying solutions for reducing lengths of production cycles and improving quality levels. The programs of the ATRC provide companies with skills and abilities to solve problems and meet the demands of the global marketplace including training in improving efficiencies through modular, low-volume manufacturing.

For the ARN VPV initiatives, the ATRC is a demonstration project illustrating the contracting process and documenting procedures to assist other contractors in meeting DLA requirements. This information is shared with potential military contractors to help them avoid problems. The DLA and DSCP look at the Demo factory as a place to deal with problems. The ATRC is thus in the role of facilitating issue identification and providing recommendations on process improvements.

2.2.2 Cal Poly ATRC DLA/DSCP Support & Quick Response Manufacturing

As a partner in the ARN VPV initiative, the ATRC uses its state-of-the-art factory to: 1) test research work of the Apparel Research Network; 2) demonstrate advanced



technology and apparel manufacturing systems for military and civilian apparel; 3) provide a hands-on learning laboratory for education and training programs; and, 4) serve as a resource to military and civilian apparel producers. The factory currently produces selected military and civilian garments in a "Quick Response" mode demonstrating shared production and direct vendor delivery systems.

The contract with the DLA provides for the Cal Poly ATRC to act as a technology transfer agent by assisting apparel businesses to do what they do better. The DLA interest is to secure companies capable of producing military products either on a regular basis or if an emergency arises. The Center has been funded to recruit and train more businesses on the West Coast as on-line military producers.

2.2.3 Cal Poly ATRC, DLA VPV Virtual Item Manager and the QLM/Retail Capabilities

As previously noted, Cal Poly was one of the original ARN partners and is the only West Coast academic institution in the ARN. As such, their early support to ARN initiatives included working with MCRD-SD. As a result, it was logical to extend their involvement with this Recruit Training Center as part of the VPV initiatives. The initial request for participation by AdvanTech came in April 1997 following the direction to Cal Poly to initiate a VPV demonstration project supporting developing and implementing an integrated supply-chain system providing RTC asset visibility and replenishment/inventory management to ultimately effect retail inventory drawdown. During the summer of 1997, concurrent with support at MCRD-SD involving the selection of QLM as a system to serve as a prototype for managing retail inventory, ARN expanded program activities with the development of the Virtual Item Manager (VIM) concept as a logical extension of the original VPV initiatives.

The Virtual Item Manager prototype is envisioned as providing total visibility of inventory levels at all DLA Depots and of the MCRD San Diego inventories. The VPV VIM will also have a predictive module that will ultimately offer the DSCP Item Manager the ability to evaluate future requirements to sustain inventories at levels that will provision all customers with 100% of required apparel on time. The VIM will link the Defense Logistics Agency (DLA), Marine Corps, and Defense Apparel Manufacturers (DAMs) information management systems into a seamless Decision Support System (DSS) at Cal Poly. Following completion of testing and modification, it is intended that this system will be suitable for use by the apparel Item Managers at the Defense Supply Center, Philadelphia (DSCP).

The Virtual Item Manager system will be implemented in four phases. Phase I consisted of implementation of the Quality Logistics Management System (QLM/Retail) in the retail environment. Phase II provides for the development of the Virtual Item Manager (VIM) data interfaces and item management screens. In Phase III, the Cal Poly ATRC "project leader" will act as a DSCP Item Manager would by using the VIM to gain visibility and predict requirements for selected apparel items being manufactured for and shipped to the MCRD. The Balanced Inventory Flow Replenishment System (BIFRS-W) model will be implemented during Phase III in order to balance manufacturing and



requisitions. The prototype will undergo refinement and further validation of the VIM and VPV prototype. The metrics contained in this Business Case will be fully evaluated and measured. After all partners and DLA/DSCP sign off on the prototype, Phase IV will include the "hand off" to the DSCP Item Managers and the expansion of the VIM throughout the industry to support participating apparel manufacturers and supply chain customers.



3.0 PROJECT OVERVIEW

3.1 Marines Corps Recruit Depot–San Diego Project Background

Personnel at MCRD-SD responsible for Clothing Initial Issue Point operations had long been aware of the difficulties in operating and managing the inventory and replenishment processes at their site. Prior to 1996, MCRD-SD Clothing Branch personnel had initiated efforts to automate internal inventory control processes. Lack of expertise and funding resulted in limited success.

The Marine Corps Uniform Material Management System (MUMMS), used to administer inventory control and material management, is a legacy system dating to development in the late 1960s and early 1970s. MUMMS, while it does provide for essential financial management reporting of expenditures and assets, does not provide real-time visibility of inventory levels, daily management information, forecasting capability, management data below the item manager level, nor automatic replenishment capability.

In the fall of 1996, MCRD-San Diego experienced critical shortages and stock-outs of long sleeve dress khaki shirts. At that time, DSCP asked the Cal Poly Demo to produce and ship limited quantities of khaki shirts to help alleviate the problem. During an initial meeting with ARN and Cal Poly ATRC representatives, MCRD-SD Clothing Division personnel also asked for assistance with appropriate installation of barcode scanners in their clothing issue area.

It was determined that it was feasible for the Cal Poly Demo to provide assistance in this area in support of project objectives. The ARN and MCRD-SD agreed to pursue a course of action where a group would study the Clothing Branch processes. The group would then make recommendations for barcode placement and use.

During the early spring of 1997, the DLA Program Manager of the ARN Program, proposed to fund an R&D project, via the Cal Poly ATRC, to develop full automated capability at MCRD-San Diego. Systems and procedures were developed as a result of these efforts and would serve as a model for other branches of the DoD. MCRD-San Diego became a full partner with the Defense Supply Center Philadelphia (DSCP) on a concept called Virtual Prime Vendor (VPV). The VPV initiative was to provide a distributor for all uniform items, to support a specific Recruit Training Center (RTC). This distributor could be part of the DLA system or an independent commercial company.

The core of the VPV concept was the use of electronic commerce technology and practices to control inventory, determine requirements, and initiate automatic replenishments, reduce lead-times, and reduce on-hand inventories at the Recruit Training Centers (RTCs). One of the hurdles to this effort was MUMMS. Developed in the 1960s for use by the Direct Stock Support Centers located at Marine Corps bases, MUMMS is unable to take advantage of technological advances in computers and electronic commerce.



3.2 DLA Project Requirements & MCRD-SD Objectives

This DLA ARN VPV initiative focused on three priorities: first, to maximize the use of automated systems and electronic commerce; second, to help develop systems to support the DLA goal of total asset visibility within the DoD; and, third, to reduce inventories and associated costs at all levels of the supply chain. The MCRD San Diego goals were to automate tedious manual processes, improve inventory accuracy, provide real-time inventory visibility, and reduce inventory levels.

All ARN project goals have a primary focus aimed at reducing costs while improving customer support. Major objectives of this project were to reduce the MCRD-SD investment in inventory without an adverse impact on the confidence in the replacement of inventory to meet clothing requirements for recruits being processed through the training center. The specific goals for the Cal Poly VPV Project are shown graphically in the following figures:

Figure 1 – 3 Year Days of Supply (DOS) Trend

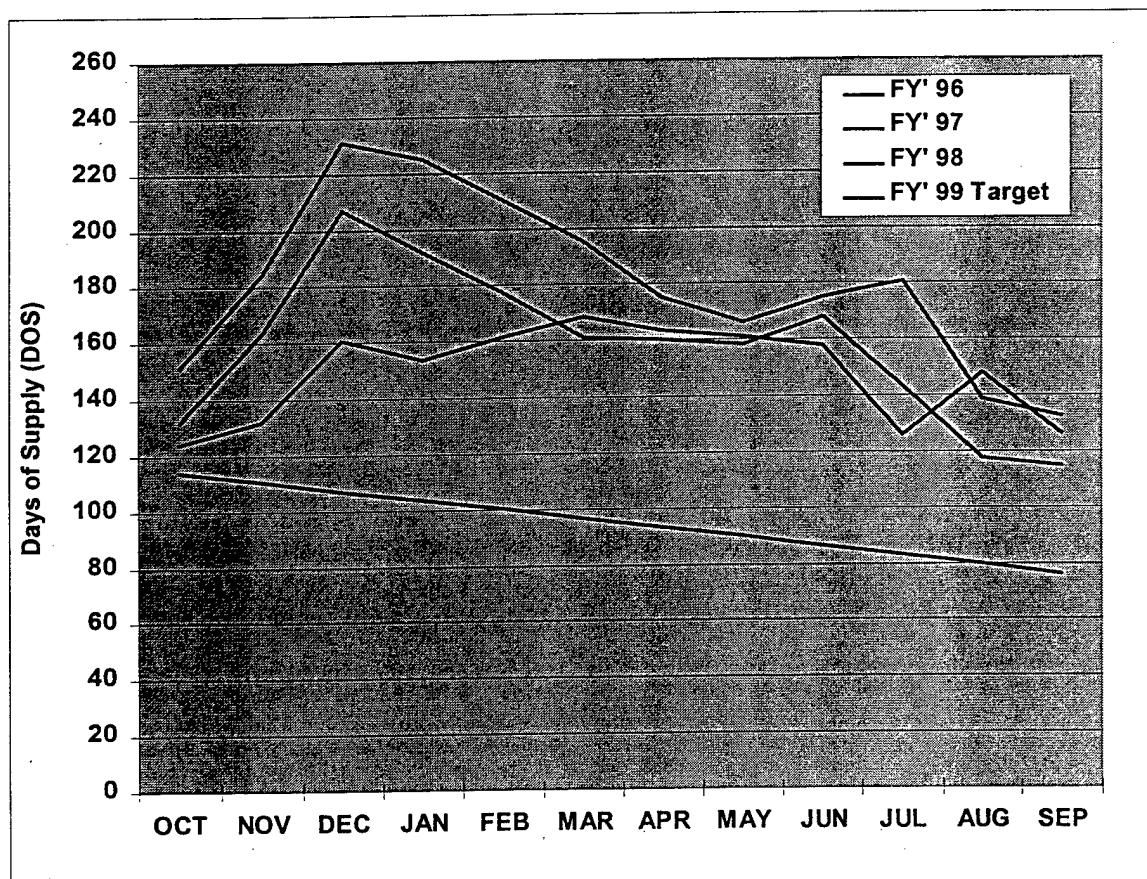
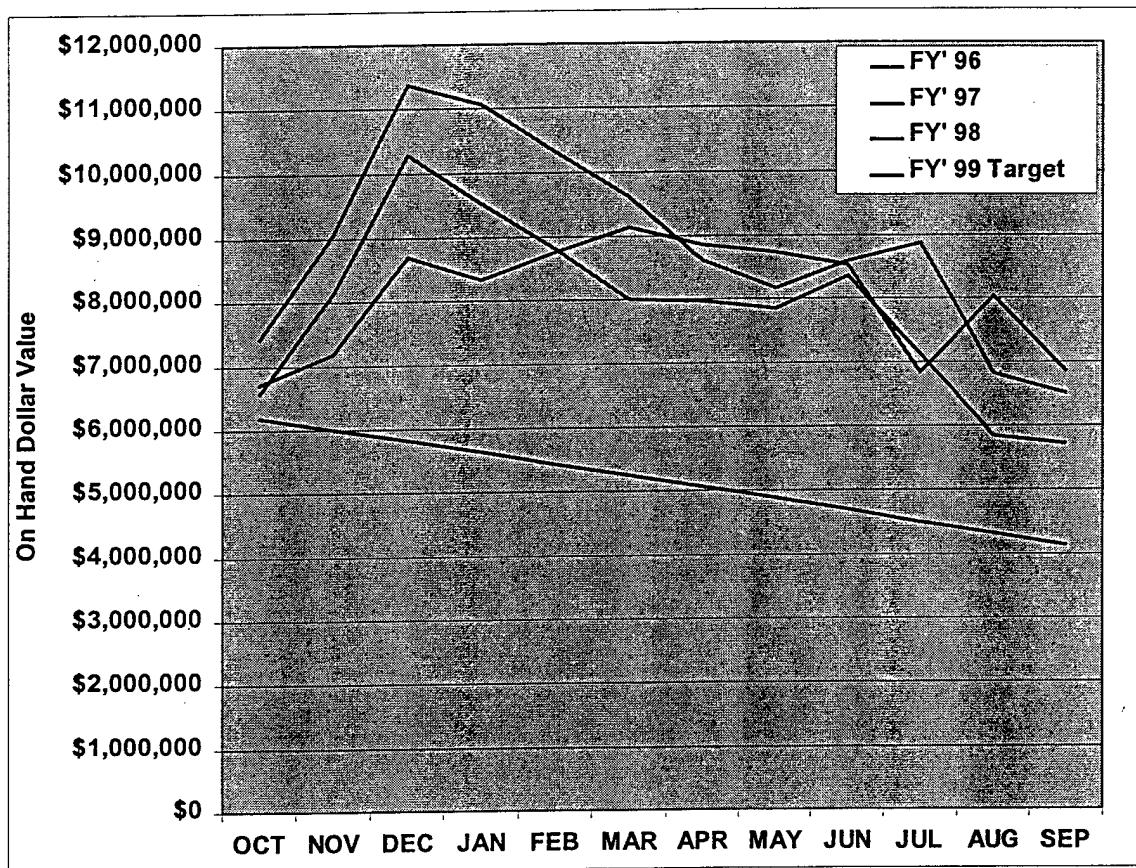


Figure 2 – 3 Year Inventory Dollar Value Trend



The Business Case prepared for this short-term project outlined the specifics of the Cal Poly effort. Summary objectives and statistics included the following:

- ◆ Develop new system to efficiently meet recruit support requirements and reduce inventories at MCRD-SD by 25% the first year, culminating in an over 60% total inventory reduction by year three of the project;
- ◆ Provide “total asset visibility” of manufacturing, DLA and retail inventory assets through a Virtual Item Manager;
- ◆ Provide “requirements forecasting” at the retail level through the Quality Logistics Management (QLM/Retail) predictive module;
- ◆ Provide for a “balanced flow” of apparel from the manufacturer through the recruit issues; and,



- ◆ Provide the DLA/DSCP with a system that can be expanded to include all DSCP apparel customers through “enterprise wide” adoption.



4.0 PROJECT APPROACH & METHODOLOGY

The project time line for the Cal Poly VPV Project ran from March 1997 through September 1999. This Final Technical Report covers that period. The project resulted from an initial assessment of operations in support of the Clothing Initial Issue Point at MCRD-SD. The Cal Poly Demo Site Director managed the analysis, design and development phases of the project to ensure customer satisfaction and obtain system acceptance. The project was completed with the expectation that the systems developed could then be proliferated to other DoD recruit induction centers.

As a result of that review, it was determined that the U.S. Marine Corps RTC, San Diego, CA required the design and development of a new inventory and order management system for recruit clothing and issue items. In addition, management preferred a traditional approach to the assessment of the current system baseline and the new system requirements. As a result, it was determined that a phased approach to accomplishing activities in a sequential fashion was essential to achieving desired results.

The first phase of project activities was to complete a traditional interview and system flow analysis with individuals in the MCRD-SD CIIP supply chain. This review provided baseline information, and the foundation for a new functional requirement. This included the preparation of cost estimates for performing the remaining steps. Support by the Cal Poly Project Team including personnel from the ARN partner EDI Integration Corp. (EIC) and AdvanTech, Inc., included flowcharting the inventory management and ordering process and preparation of baseline information on existing processes and operating costs.

Following the initial review and baseline analysis, the Cal Poly Project Team developed a functional requirements document and obtained MCRD-SD concurrence. The team also participated in a second more extensive baseline review conducted by the Logistics Management Institute. As a result, a functional requirements document defining the projected operational and informational needs of the Service and Supply Directorate was prepared along with a design specification document including analysis of alternatives and a supporting business case. These documents provided the basis for the DoD ARN Program Manager and MCRD-SD review and decision-making. The early activities resulted in a decision to proceed with funding provided by both DoD Defense Logistics Agency as part of the Apparel Research Network project, and MCRD-SD.

The immediate next step was to review available commercial off-the-shelf systems that would meet the requirements and goals identified in the business case. This effort was completed during the summer of 1997. The central considerations of the review included use of commercial off-the-shelf (COTS) software, costs that would be incurred for development of new software, or a combination of both. As this review process was being completed, it became clear that there were numerous difficulties to precluding success with commercially available software. Many of the systems simply were not adaptable to meeting the requirements of interfacing with government legacy systems using MILSTRIP formats.



As a result of the review of COTS alternatives, it was determined that the best approach in both funding required and probability of success was to use AdvanTech's existing Quality Logistics Management™ system. This system could be used as a basis for systems improvements rather than trying to build on the existing hodge-podge of "homegrown" systems that had been developed previously as band-aides for functional operating requirements, or adapting other COTS products. The reason for this was that the QLM product had been designed from its inception to serve as either a commercial application or to be used in federal government facilities using document numbers and several other standard MILSTRIP formats. Further, QLM provided the basic functionality necessary to support materials replenishment requisitioning, materials receipt, and inventory management including phase line replenishment and issues.

Once a decision was made to implement QLM as a prototype Recruit Training Center (RTC) retail inventory management capability, the project moved into the next phase. MCRD-SD provided the necessary equipment while ARN funded the expenses associated with modification of the existing QLM system and related system implementation and training activities. In addition, as a result of early reviews, recommendations were developed with the MCRD-SD management team for restructuring existing warehouse and phase line space use. MCRD-SD personnel accomplished these activities concurrent with other project activities.

The next phase of the project was the implementation and training phase. Because of the extensive changes involved in re-engineering previous manual and partial automated activities, this phase occurred over several months. In addition, suggestions for program enhancements were actively solicited from MCRD-SD base personnel and these were carefully reviewed. Those approved resulted in additional program modifications that were thoroughly tested prior to being moved to production. This phase concluded with the completion of the system acceptance and certification that required functionality had been provided.

The last phase of the project provided support for reducing inventories and monitoring benefits achieved. During this period, MCRD-SD assumed the responsibility for system maintenance expense as well as funding for additional enhancements that were outside the scope of the ARN project. This Final Technical Report was completed at the conclusion of this phase.



5.0 CAL POLY VPV PROJECT PHASES

This section of the report provides a summary of the activities that were accomplished during each of the project phases. The material presents a synopsis of key activities and findings. For additional information, the reader is directed to the ARN Web site at <http://arn.iitri.org> where all of the related monthly project reports are available for review.

5.1 Initial MCRD-SD Operations Review and Findings

The initial activities that were accomplished by the Cal Poly, EIC and AdvanTech Project Team at MCRD-SD included completion of an extensive base-line review of operations. This was followed by review of metrics related to inventory management and replenishment activities that were completed by the Logistics Management Institute. This first step was essential in understanding the existing operations, formulating and evaluating viable alternatives and developing plans for operational improvements.

5.1.1 Overview of Recruit Processing

The recruits are processed through a 12-week training program at MCRD-SD. The initial issue occurs during the first two days after arrival, followed by a second issue at the four-week point in the schedule. The initial issue is in the “Night Room” for Battle Dress Uniforms (BDUs) with all issues that occur during the first two days being processed from this location. The issue at four weeks is for the dress uniform and occurs in the main Service and Supply distribution area. Throughout the training regimen, there are additional times when recruits may require replacement of garments, adjustments or tailoring, or additional issues due to changes in physical stature from fitness training.

At the time of the initial review, the Cal Poly Project Team found that the systems tracked primary receipts of in-bound shipments from the DoD Tracy Depot with subsequent distribution to four (4) separate warehouses (physical locations). These locations in turn supplied case lot inventory issues to the supported Material Supply Unit (MSUs).

Orders for inventory to replenish the phase line issue points were not supported with any automated replenishment process and restocking was based on “eyeballing” stock levels and reordering to bring items up to an “estimated” maximum stockage level to meet “guesstimated” phase line operational requirements.

5.1.2 Inventory Management and Control Processes

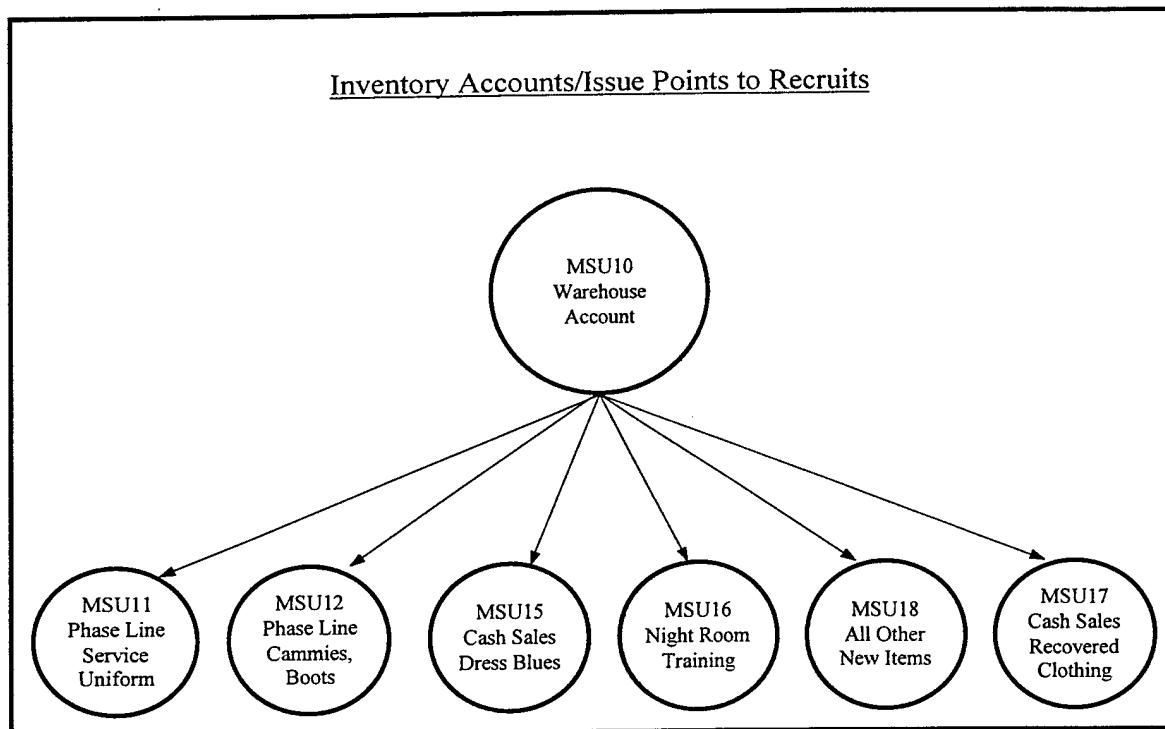
Prior to the installation of the Quality Logistics Management system, inventory was only monitored and controlled in the warehouse areas (in the wholesale account in MSU10) with a single DODAC for operations. Following the completion of this project, these same areas



continued to be supported, with asset visibility for all areas and electronic linkages for supply management and inventory replenishment provided.

The following diagram represents the relationship of the inventory locations and the Material Supply Unit (MSU) issue points at MCRD-SD.

Figure 3 – MCRD-SD Material Supply Units, designations and relationships.



Prior to installation of QLM/Retail, issues made from the MSU10 wholesale account were tracked only to the issue point. At the issue points, the total quantity on hand for each of the respective items was not maintained in a perpetual inventory. Only the total sales were recorded from the MSU10 to the sub-accounts.

A B-9 form was processed to adjust records of the issues to each of the sub-MSUs. The information processing environment prior to the installation of QLM/Retail encompassed several different systems with fragmented and redundant components. During the initial assessment phase, it was apparent that there was a need to clearly understand the functions of these different systems to ensure that subsequent design improvement recommendations incorporated the essential elements necessary for management and control.

The Warehouse Supply System was used to manage inventory in the MSU10, while the Bull's Eye system, an early attempt at automating the capture of point-of-sale (POS) transaction data, was used in the cash sales area for support and initial development of reporting capabilities. The Bull's Eye system was only partially effective since it did not provide true inventory



information, and personnel were only able to implement a very limited portion of the functional capabilities.

5.1.2.1 Phase Line - Standard Uniform Issue

The phase line at MCRD-SD provides support for standard uniform issue to recruits being processed and provides several stations for issue of items. Part of these items are issued during the first two days at the "night room," while the remainder is issued just prior to the mid-point of the recruit training process.

5.1.2.2 Item Identification

The DoD Logmars Standard code 3-of- 9 bar code label format is used to identify all items that are provided through the Defense Supply Center Philadelphia (DSCP). This includes the national stock number (NSN) information consisting of the 13 digit standard format including the 4 digit federal supply code, and the national item identification number - part 1 (2 characters), part 2 (3 characters), and part 4 (4 characters) - for a total of 13 digits. The information used is generally numeric with the exceptions being for locally assigned NSNs for selected items such as recovered clothing that is "resold" from the clothing store.

An exception to the use of the Logmars item identification standard is on the patent leather shoes provided by local vendor support and identified by the standard Universal Product Code (UPC) used in commercial sales. This required that any future systems using data capture methodologies relying on bar code information must be able to capture both Code 39 formatted information as well as UPCs.

5.1.2.3 Routine Inventory Replenishment

During the initial review, each of the Material Supply Units (MSUs) or issue stations completed a weekly request for items to be replenished to the issue point from the warehouse. This was a hand written requisition that was processed and subsequently keyed for inventory issue tracking purposes. In addition to routine issues from the main warehouse to the different MSU issue points, there were manual and partially automated systems used to track adjustments and issues to/from recruits and to/from manufacturers. There was also a separate system for tracking the consignment purchase of shoes from the supporting vendor.

As expected, recruits frequently lose weight during training requiring the exchange or issue of additional uniforms that are referred to as "profile" changes. Each item of recovered clothing is assigned a local stock number. These items may be subsequently reissued to another recruit or sold through the cash sales facility and produce revenue that is tracked with a separate system for booking cash deposits. There is a "lot" of recovered clothing that is processed.

For processing clothing of unacceptable quality, different methods were followed. Examples of unacceptable clothing issues ranged from apparel items not manufactured according to contract



specifications to product failures during the first days of use by a recruit (e.g., boot eyelets tearing making the boot unusable). Recovered clothing is classified according to its acceptability for issue from inventory to recruits, resulting in requirements for future system improvements to provide capability of tracking different categories including new clothing, recovered clothing, or unserviceable clothing that was unacceptable for issue.

5.1.2.4 Physical Inventory Process

At the time of the initial review, physical inventories were being done quarterly and there were plans to shift this activity to once every 6 months, however, the physical inventory process took several days to accomplish using the manual methods. Finally, there was an allowance of 60 days demand based inventory, 30 days for order ship time, and 15 days safety level providing an overall requisition objective of 105 days.

5.1.2.5 Exception to Routine Inventory Processing – Patent Leather Shoes

At MCRD-SD, recruits are issued dress patent leather shoes that are supplied via a direct vendor delivery program. These shoes are not supplied through the same channel as the balance of the uniform components, i.e., through the established replenishment process with the DSCP. Instead, the vendor manages delivery of the patent leather shoes as a consignment delivery process with accounting and invoicing for the shoes issued occurring after the actual issue to the recruits.

5.1.2.6 Cash Sales/Retail Clothing Sales Store

At MCRD-SD, operations of the Service and Supply branch include the operation of the self-service retail clothing store. This store issues/sells reclaimed clothing items at a discount to recruits as well as to other active duty or retired service personnel.

5.1.3 Previous “Homegrown” Automated Solution Attempts

Prior to the Cal Poly VPV Project, staff had attempted to improve support of operations through development of homegrown solutions linked to a commercial off-the-shelf product. This previous home-grown effort at internal development was structured to automate the MCRD-SD Cash Sales activity, provide automated inventory support for the warehouses, and finally planned to automate support for alterations and phase line issues.

The early effort focused on automating the inventory management and replenishment processes and proved to be much more difficult than personnel had originally envisioned. At the time of the initial Cal Poly Project Team review, the effort was deemed to be of marginal value in supporting inventory control, management, and replenishment.



The self-service store was one of the first areas targeted in early efforts by base personnel to create a system capable of electronic tracking of the inventory issued and sold. The early attempt at automating the systems at the store include allowing use of "cash/credit cards" issued to recruits during initial processing. These cards are part of the Recruit Debit Card and designed for use in Automated Transaction Machines or ATMs. Recruits are issued an individual ATM card at initial processing by Morale Welfare Recreation (MWR), with the recruit's pay tied to their account through direct deposit.

The cash sales store was equipped with a scanner/card reader and receipt printer to record transactions against the individual's account by scanning the magnetic stripe. Unfortunately, the ATM system and recording capability was not linked to the automated system and therefore could not be used to provide a detailed sales report or replenishment listing.

5.1.4 Available Recruit Information

The US Marine Corps maintains a database in Kansas City of a complete listing of recruits assigned to each training group to be processed through an RTC, e.g., MCRD-SD. During the initial assessment activities, this information was reviewed for its potential use in predicting the requirements for recruits to be processed in the future. This listing provides information used to track the initial processing of recruits through the "night room" and subsequently through the phase line processing for full uniform issue.

The recruit list is fed into the "Recruit Clothing System" or RCS that is used to track the issues to each individual recruit. This RCS is also used to track issues that are "Due Member" based on the recruit's social security number. The RCS generates a form 604 to the individual's Service Record Book (SRB). This "Due Member" listing is made up of any items that were not issued to the recruit at the time of processing through either the "night room" or the phase line. If the items are not issued prior to the recruit completing training, the "Due Member" list is forwarded for recording in the individual's Service Record Book (SRB) so that he/she can receive the missing items at a later time when inventory becomes available. The SRB is updated at that time to reflect items issued to meet shortages previously recorded in the recruit's SRB.

5.1.5 Multiple Information Systems in Current Process

During the initial review by the Cal Poly Project Team, several information systems involved in the MCRD-SD processing environment were identified. The major systems in use in 1997 included the following:

- ◆ **Bull's Eye** - This is a commercial off-the-shelf system used to provide partial tracking and capture of financial information in the Cash Sales operation and other warehouse issue points.



- ◆ **MUMMS** - Marine Corps Uniform Materiel Management System - This system operates on a MCRIC mainframe and is managed by the Operations section of Supply and Distribution.
- ◆ **RCS** - Recruit Clothing System - This is a home-grown system based on "Clipper" that was developed by one of the personnel previously assigned to Service and Supply.
- ◆ **SAMMS** - Standard Automated Management System - This system is used by the Defense Logistics Agency, Defense Supply Center, Philadelphia.
- ◆ **SASS** - Support Activities Supply System - This system is interfaced to the MUMMS.
- ◆ **WSS** - Warehouse Supply System - This program is a "home-grown" system written in "Enable"

5.1.6 Summary of Activities at Clothing Initial Issues Points

At the time of the initial systems review, the MCRD-SD Clothing Initial Issue Point system provided support for issuing uniform supplies to a large number of recruits as noted. These items were distributed at different stages of the recruits' training. The following provides a summary of MCRD-SD CIIP activities including timing and costs:

- ◆ **Day 1** - Initial issue of BDUs (training uniforms)
- ◆ **Week 5** - Full issue of uniforms to recruits
- ◆ **Recruit Uniforms** - The full uniform issue is approximately \$897 per recruit with over 18,000 recruits processed on an annual basis.
- ◆ **Recruiters** - These personnel receive additional uniform issue components valued at approximately \$480 each with 2,500 plus personnel processed each year.
- ◆ **Drill Instructors** - MCRD-SD also provides clothing issues to Drill Instructors being processed through special training programs with total issues valued at approximately \$320 per individual.

5.1.7 Summary of Initial Operational Issues

As a result of the work completed in the review and baselining process, several fundamental issues were identified for consideration in developing future improvements. It was determined



that the current MCRD-SD retail systems were not usable, and that the future solutions must interface with MUMMS. At the core were questions regarding the number of line items and issues per day/year; recruit projections by month or season; Requisition Objective levels; Safety Stock levels; Reorder Order Points; Order Ship Times. Also, future projections on the number of people are required for inventory control and inventory management, and the differences between manual and automated processes. A key consideration identified was the need to be able to project future requirements based on historical usage as well as shipping plan information.

Other details considered the processes used and to be used for routine order processing, receiving and receipt processing and month-end summaries for financial processing. These issues raised questions ranging from "Do all shipments from DSCP/Depot and manufacturers have bar code labels so receipts can be scanned into inventory during the warehouse receiving process?" to "What is the put-away process, and how is stock transferred to other storage locations, or to issue points?" In turn questions related to optimizing the stock distribution and tracking of inventory were discussed at length. The management of required pre-positioned war reserve materiel maintained as part of "readiness" was also discussed and quantified.

General management issues identified during the initial review included the extent financial management was required in the new systems as well as what method would be used for financial inventory control, including FIFO, LIFO, or Weighted Average. Linkages to other systems – particularly DSCP and ARN systems being developed to provide total asset visibility – were carefully considered at this early stage to project how orders, advance ship notices, status, point of sale, and other transactions would be transmitted whether by EDI or MILSTRIP formats, or both.

A last area of consideration was the characteristics of projected hardware that would be required. This included use of microcomputers (i.e., PC – based platforms) along with replacement or use of existing scanners and the database software desired for future DoD and MCRD systems. Consideration also included the need and requirements for internal Local Area Network linkages, firewalls for information security, and potential to use Electronic Data Interchange (EDI) with DSCP and others.

5.1.8 Summary of Initial VPV Project Objectives

During the initial site visits, it was clear that MCRD-SD was managing clothing items using an inadequate combination of homegrown inventory management and data base systems. Although there were a number of interim improvements that could have been made, it was clear that an integrated approach and system was needed that would:

- ◆ Determine requirements based on predictive rather than past consumption data;
- ◆ Compute authorized stock levels;
- ◆ Provide point of sale and issue data;



- ◆ Provide automated uniform clothing records; and,
- ◆ Offer total inventory visibility to DSCP, the vendor and the end customer.

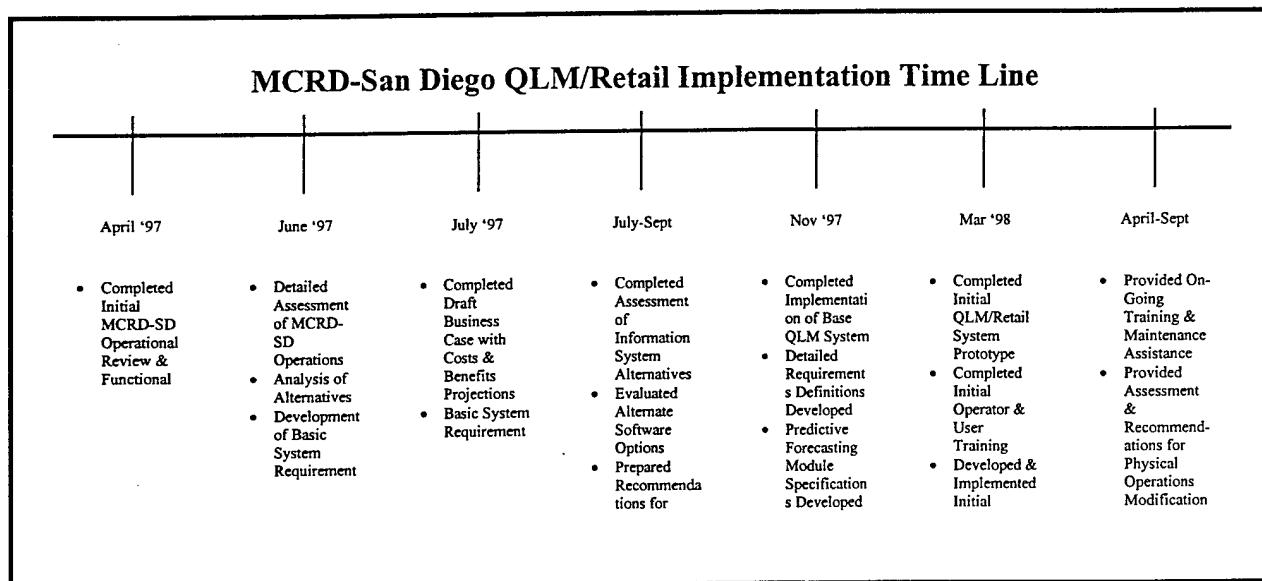
The Team was convinced as a result of early site visits, that an inventory management system could be identified (commercial off-the-shelf system) or developed that would meet the requirements of the Defense Logistics Agency as well as the Marine Corps Recruit Depot – San Diego.

As a result of the initial Cal Poly Project Team review, it was determined that with automated support, orders to support phase line inventory replenishment could be smoothed based on averages and this would eliminate problems that occurred due to the estimating processes used and periodic staffing changes. In addition, detailed and clearly defined operating policies and procedures needed to be developed as a base for training new personnel as changes occurred as a result of new systems being developed and implemented

5.1.9 Summary of Cal Poly VPV Project Implementation Timeline

The following Figure provides a summary overview of the Cal Poly QLM/Retail Implementation Timeline. These activities are described more thoroughly in the following section of this report.

Figure 4 – QLM/Retail Implementation Timeline



5.2 Initial Alternatives Identified for Cal Poly VPV Project

During the site visits in late spring and early summer of 1997, the Cal Poly Project Team discussed several opportunities to modify the current recruit processing to facilitate inventory management activities. These opportunities were identified with the caveat that they needed to be carefully evaluated to ensure that there would be no adverse impact on the amount of time required for recruit processing for Clothing Initial Issue Processing (CIIP) since time allotted for training schedules was already tight. Each of these alternatives is discussed briefly in the following paragraphs.

- ◆ **Collect Profile Information at Initial Recruit Processing** - One alternative identified is the potential to collect profile information during initial processing of new recruits at the "night room" during the 1st and 2nd days. This information would be fed into a database and used to project uniform issue requirements for the bulk activity that occurs on the phase line stations mid-way through the training program. With some refinement, it was estimated that it should be possible to project requirements to within with $80\% \pm 20\%$ of projected demand.
- ◆ **Pick and Pack For Each Recruit** - This alternative would build on the preceding alternative with the additional picking of specific items to be placed in a tote or pack for each recruit. This "pick to pack" approach would require significant modeling to determine feasibility and costs and benefits and would require individual specific information tracking.
- ◆ **Use Statistical Information for Inventory Issue Projections** - This alternative would project demand based on historical usage review and ongoing analysis using anthropometric data collected from the body scanning project (see other ARN reports for documentation on 3D Body Scan technology and related articles <http://arn.iitri.org/docs/scan/index.html>).
- ◆ **Use Touch Screens or Wireless RF Terminals to Track Issues** - This alternative would be based on use of automated technologies such as touch screens or wireless units to record issues to each recruit as they are being processed. Also, the cash sales operations would be completely revised to track the issue of specific units rather than generic items.
- ◆ **Scan Recruit and Issue Information at End of Phase Line** - This alternative would simple provide automated support for scanning recruit information and all associated issues with detailed item information at the end of processing through both the "night room" and the phase line.

At the end of the summer, meetings were held with the Cal Poly Project Team, the ARN Program Manager, and representatives from MCRD-SD. At that time, it was decided that the best approach for the next immediate step in the Cal Poly VPV Project was to move forward with the use of the AdvanTech Quality Logistics Management system.



5.3 Phase I – Quality Logistics Management Implementation Planning

On August 6, 1997, a meeting was held to review the alternatives for system improvements and use of the Quality Logistics Management system as the basis for automating support of the inventory management and replenishment process at MCRD-SD. It was agreed after careful review that the QLM base system would be modified and adapted to meet the MCRD-SD functional requirements compiled during the site visits completed during the summer months. The functional requirements would provide a guide for QLM base system modification and subsequent acceptance testing and certification of the QLM/Retail software and system.

Broadly stated, the specific requirements for modification of QLM to QLM/Retail were to adapt the base system to supporting the functional requirements of MCRD-SD, including providing essential logistics management capabilities (i.e., receiving and distribution), an early interface to ARN's Clothing & Textile Asset Visibility (CTAV - renamed to AAVS at a later date) initiative being developed by Product Data Integration Technologies, Inc., and to evolve to an efficient inventory and order management system. A specific need was that the algorithms developed to support predictive forecasting be based on tariff and shipping plan information.

From September to December 1997, the Project Team held a series of meetings with MCRD-SD personnel to review existing QLM functionality and to define modifications and enhancements necessary and desired to support operations. During the fall, the necessary equipment was ordered and base personnel redesigned the storage and issue line support systems and installed new shelving systems.

The details of the initial system design specifications for the predictive forecasting module were defined. The Project Team also compiled the MILSTRIP formats and information to link the activity being processed through QLM/Retail with the Marine Unified Materials Management System (MUMMS). Finally, the initial Business Case was completed quantifying the goals of the Cal Poly VPV Project and the estimated financial impact to be achieved.

5.3.1 Initial System Requirements

One of the first activities completed as part of the Cal Poly VPV Project was completing a preliminary requirements for QLM system installation and prototyping support for a CIIP. This included details of functional operations, screens for completing on-line activities, reports necessary to support operations and equipment needs and specifications. The operating system requirements were reviewed with Computer Information Services at MCRD-SD with a decision to use Microsoft NT for server operations and Windows 95 for workstations.

The base equipment configuration included use of Intel Pentium processors running at 133MHz or faster with at least 64MB of memory, although the QLM/Retail base software could be operated on slower machines for some activities. MCRD-SD ordered 9 new machines with delivery not expected to occur until the spring of 1998. AdvanTech also determined that the available Hand Held Terminals (HHTs) – PDT3100 Symbol Technologies Scanners – would be suitable for bar code data capture.



During these early stages, AdvanTech personnel worked with MCRD-SD operations staff to thoroughly define the methods that would be used and the software to be developed for the use of the HHTs, the support of the receiving process, support of Phase Lines and Cash Sales Store, etc. Discussion also included review of the forecasting requirement and the algorithms to be developed based on tariffs and shipping plans.

During initial planning for systems configuration, one issue identified for later resolution was that the receiving area did not have the wiring necessary to support a workstation at that location.

5.3.2 Related Issues

In a related issue, ARN was conducting an extensive evaluation of body scanning for future use in supporting DSCP Clothing and Textiles Division. The ARN Program Manager decided that the body scanner project (ARN T2P2 - Automating Information Extraction from 3-D Scan Data) would not be part of the initial systems development for supporting MCRD-SD thereby eliminating significant concerns related to design interface requirements.

A second issue was the management of war reserve materiel that was not segregated from routinely issued stock. This issue was reviewed and it was determined that there was no requirement to keep the pre-positioned war reserve materiel (equivalent to 2,000 recruits worth of issues) distinct from the normal safety stock which was part of the requisition objective. As a result, the algorithms developed provided for safety stock defined as the greater of 2,000 sets of full issue or 30 days of projected issue.

A third issue that was addressed during the early implementation activities was that inventory valuation was done at current contract replacement value. At the beginning of the fiscal year, all existing inventory was (and still is) reassessed or revalued at the new price. No other price adjustments are made during the year.

5.4 Phase II – Quality Logistics Management System Installation

This phase of activity covered the time from January to May 1998. After the holidays, the Project Team completed the installation of the hardware and modifications to the Local Area Network. All of the hardware linkages were tested and the QLM/Retail system software was installed and tested on each of the workstations. Details were worked out regarding the functionality necessary to link an NT server to the workstations over the MCRD-SD Banyan Vines network.

5.4.1 QLM/Retail Data Base Build

The Project Team worked closely with the MCRD-SD Item Manager and her staff during the early spring to complete the loading of the QLM/Retail Master Catalog Item Information and

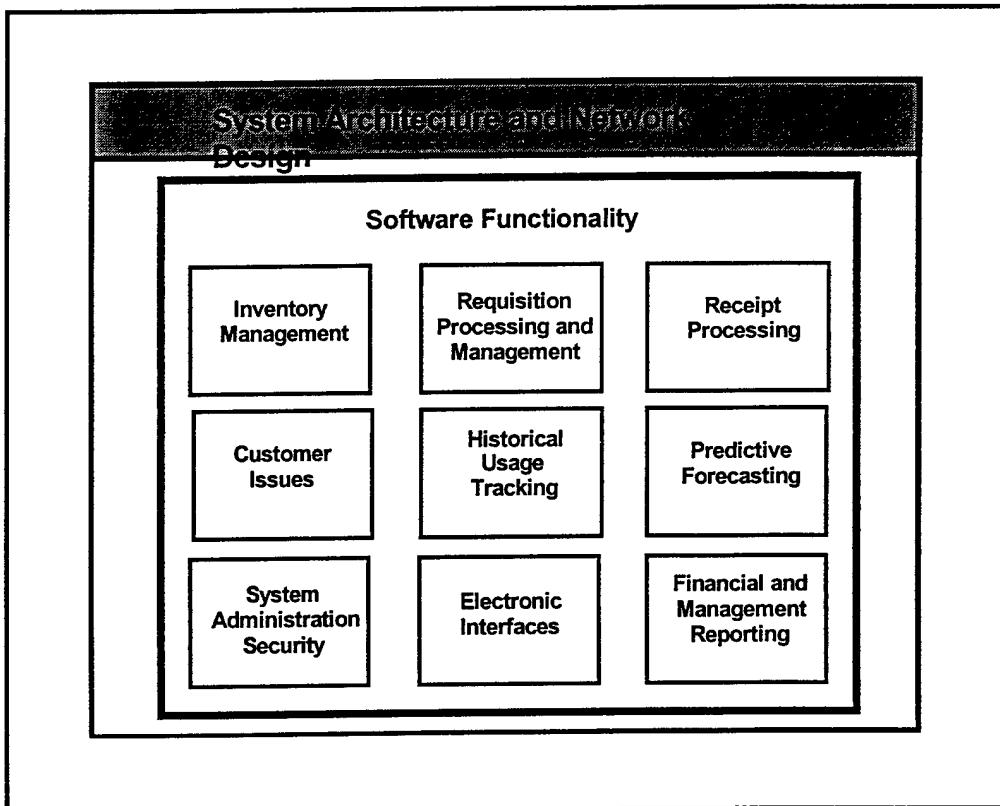


related tables. The Item Manager is the individual who had overall responsibility for ensuring that stocks are maintained at the appropriate levels and that replenishment requisitions are processed on a timely basis. The QLM/Retail data base build was therefore a critical activity that had to be carefully completed before the system implementation activities could move to completion. This included the stockage lists for the MSU10 Stockroom Catalog, the Cash Sales Stockroom Catalog, the Cost Centers, and the stockage lists for each of the Phase Line and Receiving Barracks areas.

5.4.2 QLM/Retail Initial Training

AdvanTech used a “train the trainer” approach for training all personnel in the capabilities and proper use of the QLM/Retail system. This included the system administrator training as well as the operator training. Because of the enhancements that had been made to the system, the existing QLM Training Manuals and User Manual were updated for the QLM/Retail system and enhancements. New training materials were written for using the hand held terminals to complete inventories and to process receipts. The following figure shows the key elements of the architecture provided by the Quality Logistics Management™ software.

Figure 5 – QLM Functional Architecture



The QLM system is designed to support logistics operations at the retail and wholesale levels in government facilities. The functions incorporated in the system follow the logical flow of supply chain management activities designed to meet customer support requirements. As such, the key



functional components include acquisition of supplies, receipt processing, inventory management and supporting and tracking customer issues. Additional capabilities are related to system administration, system security, and financial reporting. Each of these areas was covered thoroughly by the AdvanTech Project Team during training provided to the MCRD-SD Supply and Services Division personnel that were the users of the QLM/Retail system capabilities.

5.4.2 Stockroom Setup For Automated Operations

Concurrent with training being completed, the Cal Poly Project Team provided assistance to the MCRD-SD personnel in developing and implementing a new stock locator system to take advantage of the QLM/Retail capabilities. This required development of a plan-o-graph for all storage locations and required decisions on how incoming stock would be put away to ensure appropriate rotation. Also, staff participated in the redesign of bin and bulk stock location labels that incorporated bar codes for physical inventory and stock picking activities. Finally, personnel printed the bar code labels and labeled all locations. A last step in this process was to complete a location inventory to ensure that all items were properly placed and all storage and issue locations labeled correctly.

5.5 Phase III – Quality Logistics Management Go-Live

May 1998 - The initial systems prototyping and software installation was completed in April 1998. This included the installation of a separate Microsoft NT server along with database software for the QLM/Retail engine and testing numerous linkages to various workstations throughout the MCRD-SD CIIP operations.

5.5.1 Go-Live Physical Inventory

In late April 1998, a physical inventory was completed to validate initial quantities and related information in QLM/Retail. This also provided initial base line information for the first time of the total dollar value that was maintained at each of the Phase Line issue stations and the Receiving Barracks. This was also the starting point for the generation of daily replenishment requisitions for bringing stock back up to the predetermined levels as issues to recruits were processed and recorded.

5.5.2 QLM/Retail Operations Commence

Operations using all of the initial system capabilities began in May 1998. During the summer months, personnel reviewed operations to verify performance of each item in the functional



requirements list. As expected, staff suggested additional enhancements for review and programming if approved, and finally the system was accepted.

5.6 QLM/Retail System Acceptance, Help Desk and Maintenance

Ongoing support has been provided since the initial system was installed at MCRD-SD. This has provided help desk and ongoing maintenance of the QLM system. During the past several months from the initial go-live in May 1998 to September 1999 there have been additional modifications made to the QLM/Retail system including development of additional capabilities and modification of procedures.

In addition to work performed under the Cal Poly VPV Project, there were additional system enhancements that were requested and contracted for by MCRD-SD.



5.7 Phase IV – Post Implementation QLM Operational Refinements

The post implementation period provided follow-up and support from July 1998 to September 1998. Activities during this period focused on providing additional user training on the various operational functions with QLM/Retail, and implementation of the predictive forecasting module to assist in establishing valid reorder parameters. AdvanTech also provided training on custom query and report generation functions within QLM/Retail.

At the end of the summer, the ARN Program Manager requested that the operations personnel at MCRD-SD establish FY'1999 inventory reduction targets. This was done with the expectation that the drawdown process would occur gradually over a number of months. MCRD-SD, however, was very aggressive in their use of the QLM/Retail capabilities and rapidly reduced inventories to the target levels.

Table 1 – Summary of MCRD-SD Inventory Targets to Actual

FISCAL YEAR	DOS TARGET	DOS ACTUAL	VARIANCE	ON HAND DOLLAR VALUE TARGET	ON HAND DOLLAR VALUE ACTUAL	VARIANCE
1996	131	180	37.84%	\$6,432,397	\$8,866,357	37.84%
1997	131	158	20.43%	\$6,513,230	\$7,843,998	20.43%
1998 - PRE-QLM/Retail (Oct'97 - May'98)	131	153	16.75%	\$7,107,824	\$8,298,085	16.75%
1998 - WITH QLM/Retail (Jun'98 - Sep'98)	123	140	13.84%	\$6,642,093	\$7,561,166	13.84%
1999	95	69	(36.23%)	\$5,160,087	3,732,602	(38.24%)

As shown in the above figures, once the Quality Logistics Management™ Retail System was installed and fully operational, personnel at MCRD-SD managed their requirements coupled with achievement of substantial decreases in the on-hand operating inventories. These inventories were adjusted up and down based on the projected requirements for inducting recruits. A higher number of recruits are processed during the summer months and inventory is increased to meet higher service levels during this time.



6.0 Technical Approach

6.1 Finalizing MCRD-SD Technical Requirements

The first phase of the project focused on the initial evaluation of systems in use and provided for needs assessment. The Cal Poly Team initiated the second phase of the project by finalizing the functional and technical design requirements with MCRD-SD. These functional and technical design requirements constituted the roadmap for prototyping and adapting the Quality Logistics Management system to meet MCRD-SD's recruit clothing management needs.

The Cal Poly Project Team prepared a functional requirements checklist based on the findings from the operations review completed during April-June 1997. These requirements were then reviewed and approved by the ARN Partners and the ARN Program Manager and became the structure for the base system to be installed at MCRD-SD. This included designs for screens, reports, systems training materials, help files, and interfaces to other systems.

6.2 Evaluation of COTS Alternatives & Decision to Use QLM

After the completion of the technical requirements definition, the project team completed a systematic review of available solutions based on commercial off-the-shelf (COTS) software. It was determined that there were many different systems available although these various systems all required substantial modification and costs to provide the desired capabilities and achieve the desired results. As a result, a request was made to AdvanTech to provide its existing QLM software as a basis for the proposed system (QLM/Retail) to be installed/developed at MCRD-SD as proof of concept.

6.3 Adapting QLM To Meet MCRD-SD Requirements

Following completion of the initial technical requirements, and the decision by ARN to use QLM as the basis for the system to be developed (QLM/Retail) as part of the Cal Poly VPV project at MCRD-SD, the Cal Poly Team prototyped the existing QLM/Retail capabilities. By tailoring, modifying, and adapting the base system screens, reports, and other system infrastructure to comply with MCRD operating procedures and government names and titling, system additions were developed. Forecasting based on tariff and shipping plan interfaces were developed for the system. Designs for system interfaces were prepared for moving data to/from MUMMS and to ASCOT.

Along with adapting the basic features provided by the QLM system, additional elements were developed for enhancing CIIP operational activities at MCRD-SD. These included the design and coding of the predictive forecasting module. This module required interfaces to the DSCP systems for tariff information as well as the provision for entry of the shipping plan information.

A major system requirement was the ability to interface to ASCOT, MUMMS, and the AAVS systems. AdvanTech worked closely with personnel at the USMC Information Center in



Albany, Georgia, as well as with information systems personnel at MCRD-SD and DSCP in developing and testing these critical interfaces.

6.3.1 Modifying QLM Programs To Meet MCRD-SD Requirements

Support for operations at MCRD-SD required several modifications to the QLM system to create the QLM/Retail software. These included:

- ◆ Capability for Quality Deficiency Reports (QDR) was programmed into QLM. Data from the existing open QDRs was compiled and then keyed into the QDR database, and QLM/Retail's QDR management module was implemented.
- ◆ Programming and training support was provided in changing the QLM database system from individual workstations to site license status due to the increasing number of simultaneous users (as many as 20 workstations may be on-line at any given time in supporting MCRD-SD operations).
- ◆ QLM/Retail "run time" capabilities were added as the database application engine installed on new terminals replacing previous Intel 486 based systems in the clothing branch. Previous instances of "program hanging" ceased with the replacement of 486 technologies by Pentium systems.
- ◆ Tables were modified and fields added to track the date of the last activity for DSCP requisitions and purchase order information. Receiving information facilitated the tracking of data entry by date of data entry as well as the receipt date. Extraction methods were changed to use date entered instead of transaction date for Stockroom reconciliation processing.
- ◆ Various updates and changes to QLM/Retail reports were programmed, compiled and completed with personnel trained in the use of the new reports.
- ◆ QLM/Retail was modified to make the stock transfer function between MSU10 and MSU18 a one step function instead of the 2 steps originally designed into the system. The 2-step functions required Cash Sales to first process the requests to MSU10, and then receive the products into their inventory. The 1-step transfer process now automatically removes the stock from MSU 10 bulk and automatically adds it to the MSU18 On-Hand value.
- ◆ The Phase Line / Receiving Barracks inventory levels were reviewed and reduced. The target inventory level for these areas is now maintained between 7-14 days depending on the items.
- ◆ Development, testing and training in the use of the ASCOT and MUMMS transfer processes were completed. A summary of program changes for MUMMS MILSTRIP transactions included the following:



- 1) An expanded comments field in several tables to 35 characters to eliminate problems where selected comments were in excess of the previous seventeen-character limit.
- 2) Modified QLM/Retail tables with the addition of ship point field required for MUMMS transactions.
- 3) Credit Entry – modified View Credits screen with command to insert date entered into the credit header information.
- 4) Warehouse Denial - generated credit document, adjustment report and severe warning notice. Also modified processing to insert date of transaction into the credit information.
- 5) Inventory Adjustments modified to generate MILSTRIP B8Z / B9Z transaction information.
- 6) Receive from DSCP process generates MILSTRIP B6U receiving transactions with a new field "Ship Point" added to table with validation checks. Programs were rewritten to handle suffix assignments from SAMMS system by generating B6U MILSTRIP formats with appropriate suffixes. Entry screens were also modified to allow reading in bar code information from receiving documentation and automatically inserting information into proper fields.
- 7) Purchase Request Processing extracts A0A records for ASCOT and stores the required A0E format that is uploaded to MUMMS.
- 8) Both Daily and Month-end Processing cycles were modified. Daily Cycle extracts MUMMS transactions to be uploaded to the mainframe and the Month End Processing cycle was revised and tested to make sure the dates going into the QLM/Retail system archives were recorded using the date of entry for future historical analysis.
- 9) A new QLM/Retail MILSTRIP library that is designed to contain methods to generate all required MILSTRIP transactions for reporting information to MUMMS was developed.
- 10) System testing for processing of stock-out issues to verify the correct operation of QLM/Retail as opposed to MUMMS information was completed.
- 11) A software routine was developed that provides a feature in QLM/Retail to generate B_A ("B space A") MILSTRIP transactions that are uploaded into MUMMS to update that database.



- 12) QLM was modified to handle receipts from the prior fiscal year when the unit cost on the original requisition is not the same as the current fiscal year's unit cost. The system must receive the goods into the system using the original unit cost. It then generates an internal "Inventory Adjustment" in order to revalue the inventory at the current year's cost. These two transactions will keep the dollar values in QLM/Retail and MUMMS in balance.

At the onset of the project, it was decided to re-use any equipment available that could be salvaged for the new systems being acquired, developed and installed. In particular, AdvanTech adapted the existing Symbol Technologies PDT-3100 bar code readers for use in inventory management and receiving activities. Again, this required modification and additions to existing QLM system code, with subsequent testing and certification of capabilities prior to moving revised/new capabilities into production. Also, operations at MCRD-SD included interfacing the cash sales operation with its self-service store to the base system.

A last critical interface was the development of files to be transferred to the ARN AAVS DataMart (formerly CTAV) to meet the overarching program objectives of providing all authorized personnel in the supply chain with information on retail inventory asset levels.

6.3.2 QLM/Retail Site Training Activities

AdvanTech as the QLM contractor provided on-going support for operations at MCRD-SD throughout the Cal Poly VPV Project. Key elements of this activity consisted of training personnel in the use of the QLM/Retail and on-site maintenance support as follows:

- ◆ Training was performed on a periodic basis in use and monitoring of suggested orders and updates of manager-controlled safety stocks and reorder points and reorder quantities with the San Diego Item Manager and staff to continue the inventory draw-down, and manage stockage levels with year-end funding issue concerns.
- ◆ Training of all personnel on the receiving process involving multiple shipments and DSCP/Depot assigned document number suffixes and the use of the ASCOT transfer process, and the revised DSCP receiving procedures was completed.
- ◆ Training of all personnel on the graphic display on screen or printed to hard copy of historical usage data for any NSN was done. The display helps the staff make decisions on establishing inventory levels for each individual NSN.
- ◆ A new Cash Sales manager and staff was familiarized with QLM functions and operations, clarifying and coordinating the roles in establishing and maintaining Reorder Points (ROPs), and Safety Stocks for Cash Sales.



- ◆ Trained various MCRD-SD personnel who operate QLM/Retail with the creation of queries for ad hoc reports.
- ◆ Rewrote and provided QLM/Retail System User Guides at by updating it with input from MCRD-SD personnel that operate and use QLM/Retail.
- ◆ Trained and assisted MCRD-SD personnel to continue to revise system operations including reorder levels, reorder quantities and safety stock as well as establishing “ABC” inventory categories (A = most expensive or highest usage, B = moderate cost or usage, C = least expensive or lowest usage) for each item.
- ◆ Trained and assisted personnel in the design and development of Web Page information to report and display progress achieved on an on-going basis to the ARN community.

6.4 QLM/Retail System Architecture

The operational designs of QLM/Retail focused on providing the MCRD-SD Item Manager with the necessary tools in order to manage an inventory of between 1200 and 2000 items. QLM was initially designed using current state of the art relational database technologies along with Client/Server hardware configurations. The system allows for multiple stockrooms and data archive capacity for up to three (3) years. Capabilities of QLM/Retail that were implemented at MCRD-SD include:

- ◆ Process all data with automated replenishment order generation capability in an on-line real-time mode providing the Item Manager immediate access to on-hand quantities and reorder levels;
- ◆ Provide operations personnel with total asset visibility showing where on the inventory was located throughout the base;
- ◆ Provide automated order transmittal to DSCP with order replenishment based on predictive forecasting tools to better plan the seasonal requirements;
- ◆ Establish the ability of the Item Managers to establish reorder parameters by “ABC” classifications;
- ◆ Focus efforts of retail personnel to manage the reordering parameters in terms of Days of Supply (DOS) instead of the more conventional method of managing the quantities on hand;
- ◆ Maintain detailed audit trails that show when any suggested order quantity has been over-ridden or ignored;



- ◆ Provide and maintain detailed transaction registers to give the Item Manager the necessary tools to perform any type of inventory reconciliation;
- ◆ Use of bar code technology and handheld scanning devices to reduce the amount of manual data entry and improve the accuracy of the data; and,
- ◆ On-line reporting functionality that allows the Item Manager instant access to view the report on the screen before generating the hard copy.

The "ABC" codes mentioned above are established for each item and are based on volume of activity (dollars or units issued). Historically, "A" items represent the 20% of the items that account for approximately 80% of the retail activity. This allows the Item Manager to focus primary attention on a smaller group of items have the most effect on the retail operations the support the Recruit.

System architecture also required that the Cal Poly VPV Project Team and AdvanTech personnel work with the MCRD-SD CIS personnel to work out details regarding the functionality necessary to link and NT server to the workstations over the MCRD-SD Banyan Vines network.

6.5 Information System Security Concerns

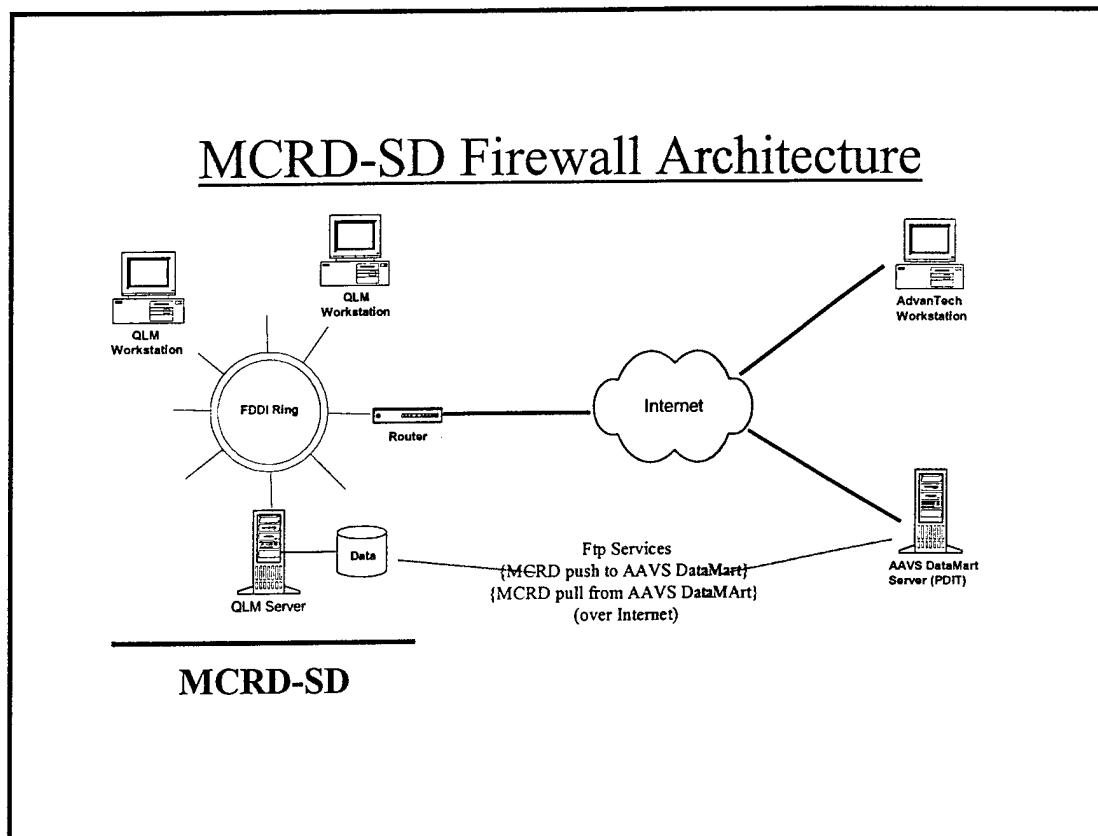
During the installation of the QLM/Retail software, one of the major issues that had to be resolved was the access to the database for updates to be provided to the AAVS DataMart to provide the information on the quantities on hand at MCRD-SD. Without this information, the VPV objective of providing this information to the DSCP Item Managers would not have been met.

AdvanTech personnel had previously reviewed requirements for remote access with MCRD-SD personnel for support of remote problem resolution, help desk support, and training. The request was to use pcAnywhere software (this is a microcomputer based software application used by AdvanTech and other companies for remote client support) for remote operation of selected user terminals (e.g., QLM/Retail MCRD-SD System Administrator). This software was not approved for this use due to increasing USMC concerns regarding potential for security risks for base information systems operations.

To resolve the situation, the Cal Poly Demo Project Team with AdvanTech and PDIT personnel met with Marine Corps personnel to devise acceptable policies and procedures to accomplish the project objectives. Ultimately, it was decided to provide maintenance and help desk support via on-site visits and telephone to resolve problems. The processes used are illustrated in the following diagram.



Figure 6 – MCRD-SD Firewall Architecture



It was decided to use File Transfer Protocols (FATP) to designated Internet Protocol (IP) sites from MCRD-SD outbound to provide the necessary asset visibility information to the AAVS DataMart. The MCRD-SD System Administrator or Retail Item Manager can also retrieve files from the PDIT/VIM server (pulled by MCRD) anytime they want information from VIM (primarily SAMMS data). These processes have proved to be acceptable and are in use today at other sites to ensure military base operating systems are maintained in a secure state. Additional information may be available through review of the MCEN Security Policy.



7.0 CAL POLY VPV PROJECT BENEFITS

Adaptation of commercially available inventory and order management software, Quality Logistics Management™, provided an integrated, state of the art retail inventory and order management system for the Marine Corps Recruit Depot-San Diego. The original objectives were to provide support for the Retail Item Manager with essential tools to achieve a phased inventory reduction over a 12-month period or sooner.

The time frame for accomplishing the objective was dependent on the ability of MCRD-SD staff to achieve a satisfactory comfort level in operating with reduced inventories managed with the QLM/Retail system. QLM/Retail was designed to provide a comprehensive set of easy-to-use custom tools, and is feature rich from the logistics management and operations perspective. This section summarizes the Cal Poly VPV project conclusions and benefits achieved.

7.1 Conclusions and Summary Recommendations

As the facilitator of operational improvements, the Cal Poly Project Team carefully considered the importance and impact of decisions made at the MCRD-SD CIIP, how these in turn affected the supply replenishment and contracting processes at DSCP, the impact on manufacturers, and the services provided by the depots at the wholesale level.

- ◆ **End of tariff items must be managed differently than the high volume items.** The retail customer should be able to requisition these items in units of "each" and not in full cases. Ordering patterns and product utilization become distorted when a retail RTC has to order a full case of an item (e.g., 30) when their annual usage is substantially less than that number.
- ◆ **On-going user training is critical** for a minimum of 12 months after this type of system is activated. It is important to continually monitor what is happening in order to ensure everyone is taking full advantage of the capabilities provided by QLM/Retail.
- ◆ **Order Ship Time (OST) variability plays a large part** in the retail Recruit Training Center's ability to effectively reduce it's own inventory. The more consistent the delivery times, the more confident the Retail Item Manager feels about reducing inventory.

Throughout the project, one of the most important lessons learned was the need to provide adequate support during the different project phases. At each phase, it was critical to ensure that both the management team and operational staff understood the issues considered, alternatives identified, and new processes to be implemented. In order to achieve the optimum benefits, personnel must be cognizant of the importance of properly establishing – and *subsequently* maintaining – the parameters that are the basis for the calculations performed by the automated support capabilities.



One of the issues discussed at length throughout the Cal Poly VPV Project was that MCRD-SD was at one end of the supply chain. To achieve results across the entire chain – from the point of the manufacturer, through the distribution process, to retain inventory locations, and ultimately to issue/consumption – will require the availability and use of the other tools currently being developed by the ARN partners in concert with DLA and DSCP. These include the use of QLM/Central designed to manage redistribution of wholesale inventories, the ASAPWeb being developed to facilitate contract management and vendor's bill and hold inventories, and the Balanced Inventory Flow and Replenishment System (BIFRS-W). Each of these is discussed in other project reports available from ARN (see <http://arn.iitri.org/index.html>).

A second emerging issue is the need to evaluate and manage the costs of transportation activities across the supply chain. QLM/Central is being designed and developed with consideration of the impacts and added costs of moving stock too frequently from one depot to another when the stock can be replenished more efficiently directly from a vendor held inventory. These costs will become more important as the inventories are reduced and the focus shifts to managing the distribution strategies as a key part of achieving effective and efficient support across the supply chain continuum.

7.2 Benefits Achieved

The primary value of the Cal Poly ATRC demonstration to the ARN VPV initiatives has been to provide proof of concepts in adapting the state-of-the-art inventory management capabilities provided by the Quality Logistics Management™ software (QLM/Retail) to enhance the management and replenishment of CIIP inventory items. The key lessons learned were that the use of standards such as reorder points, reorder quantities, and safety stock could be adjusted and managed with automated capabilities. The results provided the QLM/Retail system users with confidence in their ability to use the system functions for monitoring and maintaining essential support. The QLM/Retail inventory management capabilities also improved customer linkages across the supply chain through accurate projection of operating inventory requirements. Summary benefits included the following:

- ◆ MCRD-SD proved its ability to reach the projected \$5.0 million inventory reduction targets within the first three years of QLM/Retail operation.
- ◆ Inventory turnover was increased from an initial level of approximately 2.3 turns to over 6 inventory turns per year.
- ◆ The use of the QLM/Retail system reduced the amount of “impulse buying” by focusing the RTC Item Manager’s attention on the inventory levels instead of the quantities on hand and available budget dollars.
- ◆ Most purchases are now handled as smaller replenishment purchases that smooth manufacturing and supply replenishment rather than as large buys that are made at the beginning of the fiscal year.



- ◆ Inventory levels are maintained on-site today at MCRD-SD at an average level of below 70 days of supply or slightly more than \$3.7 million worth of inventory.
- ◆ The QLM/Retail system provides the MCRD-SD Supply and Services Division with the tools necessary to effectively and efficiently manage an annual throughput of clothing issues in excess of \$18 million.
- ◆ The QLM/Retail system provided use of hand held terminals for receipt processing, phase line replenishment, and physical inventory activities. The results achieved in completing different activities as a result of these source data acquisition automation efforts was that data entry effort was reduced by 50% or more.

The following table provides a summary of the key benefits that were provided through the implementation of the QLM/Retail system at MCRD-SD. The capabilities are shown before and after the installation of the QLM/Retail system.

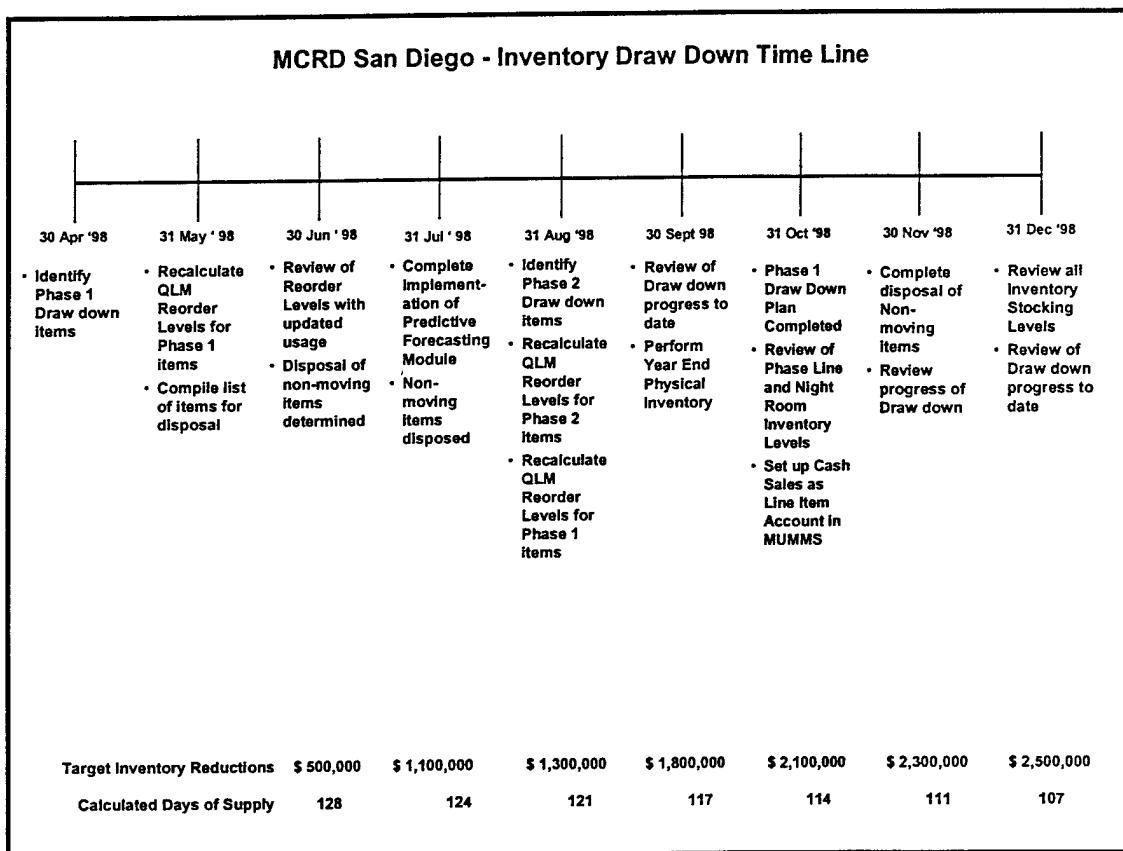
Table 2 – QLM/Retail System Capabilities

	BEFORE	AFTER
Inventory Management	<ul style="list-style-type: none"> • Manual inventory processes • Batch weekly inventory status reports • Single bulk inventory visibility 	<ul style="list-style-type: none"> • Automated on-line updating of inventory balances • Integrated bar code technology for data collection • Complete NSN detailed visibility through Recruit issue
Requisition Processing and Management	<ul style="list-style-type: none"> • Batch Generation of material requirements • Requisition data re-keyed into system 	<ul style="list-style-type: none"> • Automated daily suggested order quantities • Data entry by exception
Receipt Processing	<ul style="list-style-type: none"> • Batch entry of Receipts • Manual paper trail for accountability 	<ul style="list-style-type: none"> • Automated update of quantity on hand • Internal transaction history maintained for accountability
Customer Issues	<ul style="list-style-type: none"> • Manual tracking of Recruit issues • Manual data entry of Cash Sales transactions 	<ul style="list-style-type: none"> • Integrated bar code technology for tracking Recruit issues • Automated transfer of Cash Sales transactions
Historical Usage Tracking	<ul style="list-style-type: none"> • 30 days historical usage available to users • Limited automated report generation capabilities 	<ul style="list-style-type: none"> • 36 months of usage data available on-line • Custom report generation by user is available
Predictive Forecasting	<ul style="list-style-type: none"> • Requisition objectives based on past consumption and DSCP Tariffs 	<ul style="list-style-type: none"> • Forecasts based on future Recruit activity • Tariffs based on local utilization
System Administration Security	<ul style="list-style-type: none"> • System and software maintained in Albany, GA • Mainframe technology with no limits once system has been entered 	<ul style="list-style-type: none"> • Local NT/Client architecture • User access limited based on job duties and responsibilities
Electronic Interfaces	<ul style="list-style-type: none"> • MUMMS / SAMMS Linkages 	<ul style="list-style-type: none"> • Linkages to MUMMS, SAMMS, ASCOT, Electronic Order Form, and VIM/VPV Cal Poly
Financial and Management Reporting	<ul style="list-style-type: none"> • Current detailed reports condensed manually using spreadsheet software 	<ul style="list-style-type: none"> • Standard reports automatically generated • Custom report generation functionality available



The Cal Poly VPV project clearly showed the results that can be achieved through linking the management teams in different parts of the supply chain through a collaborative process targeted on specific desirable results. The results in this case were driven off of targets established for inventory operating levels, including both days of supply and dollars, and focused on ordering in units that would not adversely affect operational costs across the entire supply chain, particularly at the DSCP and the supporting Depots. The following figure shows the initial time line established for initial inventory draw down at MCRD-SD. This was subsequently raised to a much more aggressive level as shown in the charts below.

Figure 7 – Initial MCRD-SD Inventory Draw Down Time Line



As a result of this project and the capabilities provided by the QLM/Retail software, the staff at MCRD-SD established new inventory targets as part of an inventory draw-down process, was able to achieve the projected inventory draw-down at the beginning of the fiscal year and have maintained that level of performance since then.

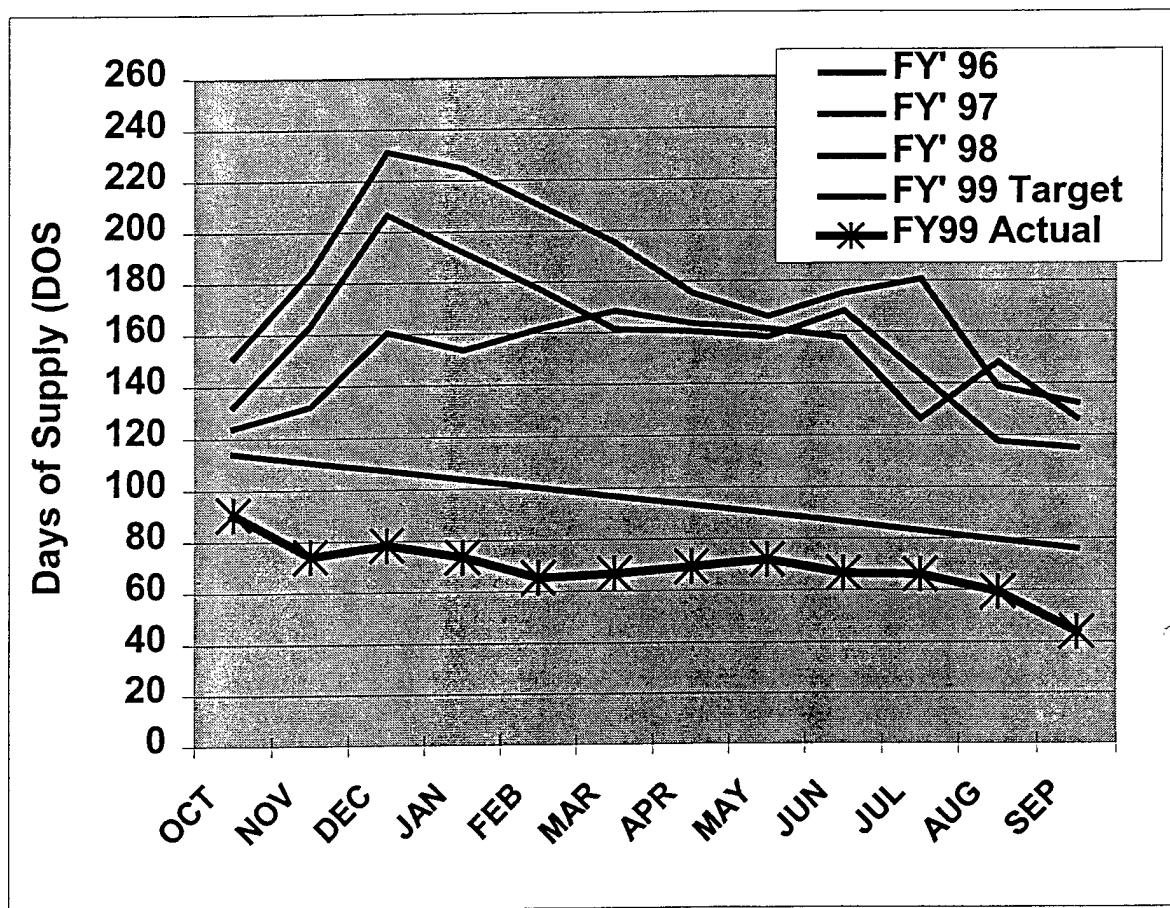
Current results for MCRD-SD show achievement of reduction/draw-down of inventory *in excess of \$4,000,000 – over 50%* – since the Quality Logistics Management (QLM/Retail) software became fully operational in May 1998. The targets for inventory operating levels were again



evaluated in September 1998 and MCRD-SD personnel agreed to reduce inventory even further. MCRD-SD personnel became confident in their ability to maintain adequate levels of stock to meet requirements because of the QLM/Retail system and the enhanced support being provided by DSCP.

The following figures provide a summary of the benefits achieved by the inventory draw down at MCRD-SD. Current operating levels continue to be maintained below the target levels originally established due to the superb efforts of the staff at MCRD-SD to attain and exceed their performance goals.

Figure 8 – Summary Days of Supply Performance After QLM Implementation



As shown in the above graphic representation, the target established for the MCRD-SD inventory draw down in FY 1999 was set at a starting point of 114 days of supply (DOS) (based on the projected number of recruits to be processed) and an ending target of 76 DOS. This corresponded to an inventory target level at the beginning of FY 1999 of \$6,184,702 and an ending value of \$4,135,472. The details for the performance targets and the actual performance achieved are shown below in Table 2 – MCRD-SD FY 1999 Inventory Targets and Performance.



Both Figures 9 and 10 show that the actual performance achieved by the Services and Support Division at MCRD-SD was significantly better than the targets established. In fact, the performance for the entire year was maintained at an average level that was below the initially established starting level. This was a superb effort and could not have been accomplished without the on-going management efforts of the personnel at MCRD-SD.

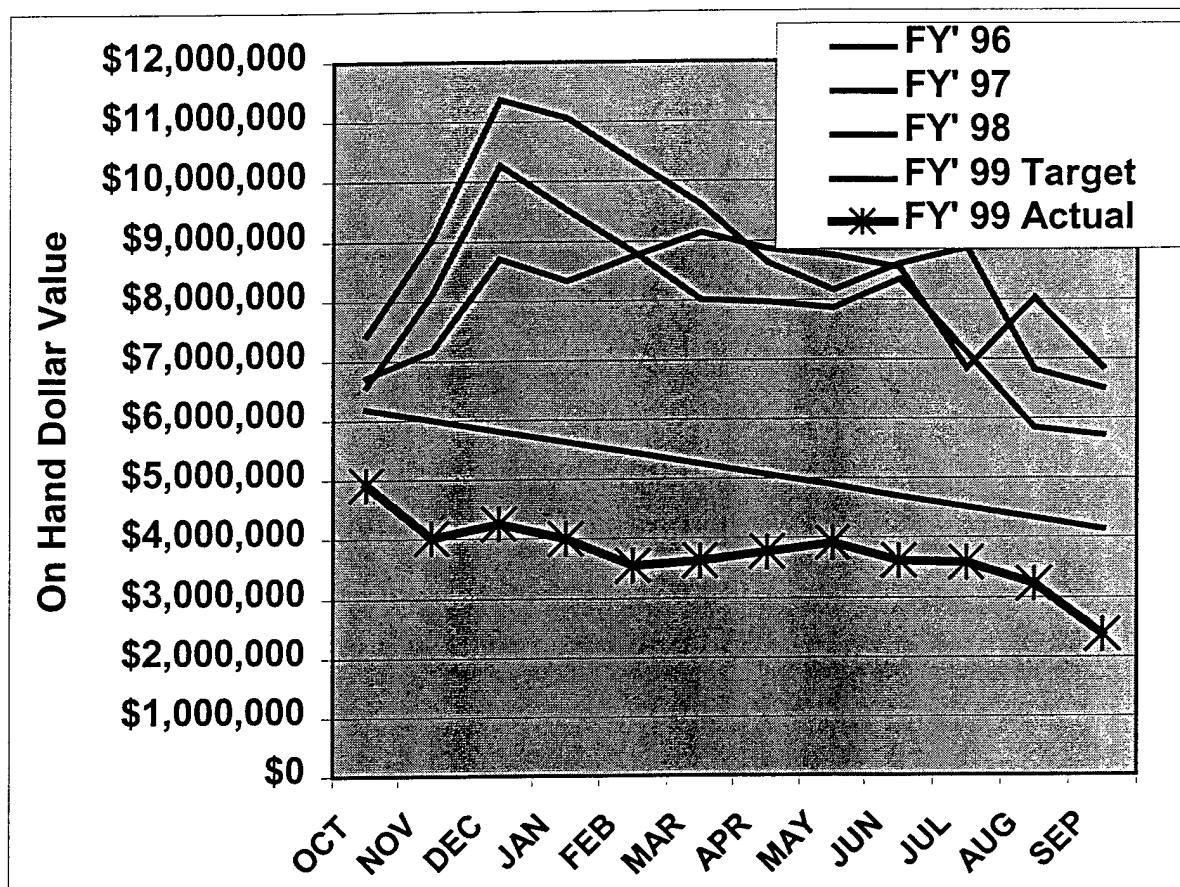
Table 3 – MCRD-SD FY 1999 Inventory Targets and Performance

FY 1999 MONTH	ACTUAL INVENTORY DOLLARS	TARGET INVENTORY DOLLARS	ACTUAL INVENTORY DAYS OF SUPPLY	TARGET INVENTORY DAYS OF SUPPLY
October	4,912,738	6,184,702	91	114
November	4,018,922	5,998,409	74	111
December	4,248,427	5,812,115	78	107
January	3,994,102	5,625,821	74	104
February	3,543,949	5,439,528	65	100
March	3,620,921	5,253,234	67	97
April	3,766,699	5,066,940	69	93
May	3,907,552	4,880,647	72	90
June	3,608,241	4,694,353	66	86
July	3,579,264	4,508,059	66	83
August	3,217,695	4,321,766	59	80
September	2,372,718	4,135,472	44	76
AVERAGE	3,732,602	5,160,087	69	95

The following figure shows the actual performance achieved during FY 1999 at MCRD-SD based on the inventory investment. As shown, the inventory level at the end of September 1999 was at an all time low level of just under \$2.4 million. At this level, the staff reported they were spending slightly more time on managing low unit of use items and were working closely with personnel from the DSCP Clothing and Textiles unit to maintain acceptable performance standards.



Figure 9 – Summary Inventory Level Performance After QLM/Retail Implementation



In summary, the results of this Cal Poly VPV Project resulted in a system that could be used to support any recruit clothing initial issue point operation or comparable inventory management and issuing activity. The results achieved clearly indicate the positive return on investment that can be accomplished through the use of an automated logistics management capability based on state-of-the-art software.



Appendix

Definition of Acronyms

- ◆ **ARN** – Apparel Research Network made up of selected industry and academic partners working together to develop innovative solutions for the apparel industry's support of military departments.
- ◆ **ASCOT** – Automated System for Cataloging and Ordering Textiles
- ◆ **ARN AAVS** – the ARN Asset Visibility System being developed to provide asset visibility across the supply chain (i.e., all locations) to DSCP Item Managers and others.
- ◆ **ASAPWeb** – The Automated Supply Apparel Processing (ASAP) Internet Web based capability for use by manufacturers in reporting status of work in process and quantities of finished goods in their respective inventories.
- ◆ **ATLASS** - Asset Tracking Logistics Activity Support System - This system is the planned future replacement for the MUMMS as a new client server platform operating in a "Windows" environment planned for replacing SASS.
- ◆ **BullsEye** - An "off the shelf" retail inventory management system designed for small "mom & pop" stores and liquor stores previously used at MCRD-SD. This system ran independent of MUMMS, and was used in an attempt to establish an unofficial inventory system for MSU10 warehouses.
- ◆ **BDU** - Battle Dress Uniforms, commonly referred to as "cammmies".
- ◆ **C&T** – Clothing and Textiles Division of the Defense Supply Center Philadelphia.
- ◆ **CIIP** – The Clothing Initial Issue Point referring to the locations where recruits are inducted into a branch of the military and receive their initial issue of clothing.
- ◆ **DFAS** - Defense Finance Accounting System - This system interfaces with DSCP for financial activities such as receiving verification. This platform tracks authorizations for vendor payments.
- ◆ **DoD** – Department of Defense.
- ◆ **DOS** – Day(s) Of Supply.



- ◆ **DSCP – Defense Supply Center Philadelphia** - DSCP controls the procurement and distribution of Medical, Subsistence (i.e., food), and Clothing and Textiles commodities to Defense Logistics Agency (DLA) depots and stock record accounts worldwide.
- ◆ **DVD** – Direct Vendor Delivery system where a vendor provides supplies ordered directly to the customer rather than first shipping the items to a depot.
- ◆ **EDI** – Electronic Data Interchange standards are used to facilitate computer-to-computer information transfers to achieve timely, accurate transfer of ordering data and related transactions.
- ◆ **EOQ** – Economic Order Quantity
- ◆ **Marine Corps Shipping Plan** – This document details the number of recruits the Marine Corps plans to train per year and the planned arrival dates at each Recruit Induction Center.
- ◆ **MILSTRIP** – Military Standard Replenishment System
- ◆ **MSU** - Material Supply Units or issue stations including the bulk warehousing operation at the RTC and the individual Phase Line issue points.
- ◆ **MUMMS** - Marine Corps Uniform Materiel Management System - This system operates on a MCRIC mainframe and is managed at the RTC base level by the Operations Section of Supply and Distribution. This is the system used to requisition, issue and receive stocks by the Direct Support Stock Control (DSSC). MUMMS is the only “live” inventory management system for stocks in MSU 10.
- ◆ **NSN** – National Stock Number
- ◆ **OL** – Operating Level
- ◆ **OST** – Order Ship Time
- ◆ **PQDR's** – Product Quality Deficiency Reports are used to track items that are outside acceptable standards for issue to recruits. These reports provide for communication with DSCP Item Managers regarding problems of quality that are encountered.
- ◆ **PWRMS – Pre-positioned War Reserve Materiel Stocks**. MCRD-SD commingles approximately 1.7 million dollars of Marine Corps directed PWRMS with operational stocks in MSU 10 Warehouses. PWRMS is commingled to facilitate rotation. The Headquarters Marine Corps mandates that the PWRMS be utilized to provision 2,000 recruits in preparation for war or other contingencies. Thus, the dollar value of PWRMS must be deducted from the total MSU



warehouse inventory dollar value to arrive at the inventory supporting phase lines (issue points) at the MCRD-SD.

- ◆
- ◆ **QLM** – Quality Logistics Management™ – Material management inventory system supporting acquisition, issues and distribution and predictive forecasting.
- ◆ **QLM/Retail** – The QLM software with enhancements implemented as a retail inventory management system supporting acquisition, issues and distribution and predictive forecasting at MCRD-SD with interfaces to ASCOT and MUMMS.
- ◆ **RCS** – Recruit Clothing System - This system is a “clipper” DBase system used to interface between the personnel system and the clothing issue element of MCRD. The RCS is used to produce automated 604s used at the phase lines.
- ◆ **RO** – Requisition Objective
- ◆ **ROF** – Reorder Frequency
- ◆ **ROQ** – Reorder Quantity
- ◆ **ROP** – Reorder Point
- ◆ **RTC** – Recruit Training Center (includes Army CIIPs)
- ◆ **SAMMS** - Standard Accounting and Material Management System - This system is used by the Defense Logistics Agency, Defense Procurement Support Center.
- ◆ **SASS** - Support Activities Supply System - This system is interfaced to MUMMS at the base operations level. This is a Marine Corps “mainframe” platform used to support Operational Marine Units (also called the “Fleet Marine Force”). There is no SASS interface with DSSC for clothing management. SASS supports base level programs such as the desks, chairs and other property management commodities.
- ◆ **SL** – Safety Level.
- ◆ **VPV** – Virtual Prime Vendor
- ◆ **WSS** - Warehouse Support System - This program was a “home-grown” system written in “Enable” that was previously used for changing locations within MSU 10, deleting obsolete NSNs and uploading inventory counts provided by the warehouse supervisor to MUMMS. It was replaced by the full functionality of the QLM system.



**Ft. Leonard Wood
Recruit Induction Center
Clothing Initial Issue Point**

**Site Visit Review
&
Alternatives Evaluation**

ARN Team

15 October 1998

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I. EXECUTIVE SUMMARY

A. Overview

This paper presents an assessment of current recruit clothing management practices at Ft. Leonard Wood, Missouri (FLW), and provides recommendations for improvements. The recommendations were developed based on the guidance that they should focus on assisting the Army's effort to reduce inventory investment by implementing technologies and practices developed by the Apparel Research Network (ARN). Detailed guidance was provided in the Statement of Work (SOW) provided in Section II.

B. Project Approach

An ARN Team comprised of five ARN members conducted a three-day assessment at Ft. Leonard Wood. The team was accompanied by representatives of the Defense Supply Center Philadelphia (DSCP). The team met first with Ft. Leonard Wood personnel to discuss the SOW with an emphasis on the objectives. Ft. Leonard Wood next provided an overview and walk through of the entire operation. On the second day, the team conducted a careful review to document functional processes and support activities. Finally, an out-briefing was conducted to present summary observations and findings and to clarify Ft. Leonard Wood's objectives.

C. Recommendation Development Process

The ARN Team defined three possible scenarios based on evaluation of current operations and ongoing efforts. The first is the base line of only implementing the Automated (Army) Clothing Initial Issue Point System – Revised (ACIIPS-R). The second is to split inventory ownership with DSCP owning the bulk assets. The third is to have DSCP own all assets in bulk storage and in the issue lines. Ft. Leonard Wood specifically requested this third scenario.

For each of the *two new scenarios*, the ARN Team developed three options. The first option in each of these new scenarios is called "Enhanced ACIIPS-R" and indicates the addition of BIFRS-R (Balanced Inventory Flow Replenishment System – Retail) functionality to ACIIPS-R. The second option is called "Local QLM" and indicates the full installation of QLM™ (Quality Logistics Management) System at the Recruit Training Center (RTC) with interfaces to ACIIPS-R at the site. The third option is called "QLM Central" and provides for a QLM server to be installed at the site to mirror the outputs of ACIIPS-R with QLM also installed at DSCP for operational management and support of inventory replenishment at Ft. Leonard Wood by DSCP personnel.

To determine the relative ranking of the options, the ARN Team combined all of the stakeholder objectives and placed them into groups. Each of the groups then became option evaluation criteria. Relative weights were assigned to each criteria based on team discussion and judgement. Next, the options were evaluated/compared to each other criteria by criteria, and assigned relative weights or scores. Finally, the value for each scenario was multiplied by the weight assigned to the evaluation criteria and the results summed as shown in the Decision Table in Section X.

D. Summary Recommendation

The ARN Team's recommendation is to implement the scenario providing for full ownership of both bulk and phase issue line inventory by DSCP supported by a mirrored QLM server installed at Ft. Leonard Wood and a host QLM server installed at DSCP.

(**Note:** This scenario is recommended for consideration for implementation at Ft. Leonard Wood because of the adverse impact on base operations - additional personnel and space and storage redesign and allocation - that would be required to physically separate and control separate ownership of bulk and issue line inventories. The physical constraints at Ft. Leonard Wood may, *or may not*, be encountered at other sites.)

II. ASSESSMENT PURPOSE (SOW)

A. Summary Objectives for Review of Ft. Leonard Wood CIIP Activities and Support

The following key statements summarize the Statement of Work (SOW) developed for this ARN Project. (Note: The SOW provided for this project is provided in Section II.B.)

1. Under the scope of the existing ARN VPV Demo, conduct a feasibility study and make recommendations for DSCP to automate inventory replenishment management of the Army's bulk CIIP assets at Ft. Leonard Wood.
2. DSCP and the ARN Program Manager provided detailed guidance for this project through a statement of work. Deliverables are a written assessment and recommendations and a decision briefing on 15 October 1998.

The assessment follows the SOW except for the additional consideration of DSCP owning the entire 60 days of supply including the 2 to 3 days on issue lines rather than just the bulk stock. This change was requested by FLW and approved by DSCP.

B. ARN-VPV Feasibility Study - Ft. Leonard Wood Statement Of Work

The following is the Statement of Work for this project and report.

1. Purpose

Under the scope of the existing ARN VPV Demo, conduct a feasibility study and make recommendations for DSCP to automate inventory replenishment management of the Army's bulk CIIP assets at Ft. Leonard Wood.

2. Assumptions

1. DSCP will take ownership of the bulk CIIP inventory at Ft. Leonard Wood and Ft. Leonard Wood will operate it without an increase in current retail or wholesale resources.
2. The bulk CIIP assets will be physically separated from the retail issue-line assets. Accountability will change hands upon movement from bulk CIIP storage to the retail issue lines.

3. An ARN software will be installed to replenish and maintain the bulk CIIP stock accountability.
 4. Routine retail issuing replenishment will be executed daily and the requisitions (A0As) sent to the ARN software.
 5. Managers at DSCP will have near real time visibility of the bulk and retail issue-line assets through AAVS.
 6. Replenishment of the bulk assets will be conducted by repositioning assets from depots and DAMs based on the supply-chain balanced inventory flow concept.
 7. The restocking of the issue-line and the replenishment of the bulk inventory will be as automated, simple, and user friendly as possible.
 8. The results/recommendations of this feasibility study will be adaptable by other ARMY RTCs (not limited to Ft. Leonard Wood).
3. Deliverables
1. Conduct a mid-level process flow of the current operations at Ft. Leonard Wood's CIIP. This flow will be in sufficient detail to determine the amount of work that will be required to implement ARN solutions for inventory management.
 2. Determine the best solution(s) considering the criteria of implementation speed, disruption of current processes, inventory accuracy, inventory reduction potential, scalability to other RTCs, and implementation costs.
 3. Formally present the written study and a decision briefing to DSCP and invited guests NLT 15 Oct 98.

C. Statement of Work for the Apparel Research Network ARN-VPV Project

(Note: This project provided the basis for the project review at Ft. Leonard Wood.)

1. Background

The Defense Logistics Agency (DLA) is America's logistics combat support agency. DLA's key mission is the supply of food, clothing, fuel, medicine, and spare parts to America's Armed Forces during peacetime and emergency. Historically in the area of military apparel, DLA has maintained high inventory levels to support surge

requirements and avoid stockouts due to long procurement and manufacturing lead times. These inventories have been maintained at great cost at the recruit training centers and DLA depots. With the downsizing of the military it became essential to streamline the DLA apparel supply chain to reduce inventories and to shorten lead times.

In February 1997 the Apparel Research Network (ARN) DEMO sites were directed to initiate Virtual Prime Vendor (VPV) Demonstrations. Two such demonstrations are underway:

1. Clemson Apparel Research in cooperation with the Albany Depot and the Marine Corps Recruit Depot, Parris Island (MCRD, PI).
 2. Cal Poly Apparel Technology & Research Center in cooperation with the Tracy Depot and the Marine Corps Recruit Depot, San Diego (MCRD, SD).
2. Scope / Objective

The scope of the ARN Virtual Prime Vendor program is to address all components of the military recruit apparel supply chain including manufacturing, wholesale and retail to enhance asset visibility and management at each level. ARN VPV is developing and implementing an integrated supply-chain system that will provide total asset visibility and balanced inventory flow for the entire supply chain. It will result in significant retail and wholesale inventory draw-down, will level the defense manufacturers' production capacities, shorten supply chain lead time, and will minimize stockouts. MCRDs SD and PI are the first implementation sites.

3. Tasks/Deliverables

To accomplish the objectives the following major tasks are active:

- a. Supply Chain Integration Level Task

ARN Asset Visibility System (AAVS) – to provide supply chain managers, as well as all the participants in the supply chain, with near real-time visibility of current status and/or historical information to support improved forecasting, analysis, and ordering decisions along with improved procurement actions. This system will act as a single information hub (called the AAVS DataMart) for all participants as it performs daily extractions from a wide variety of wholesale, retail, and manufacturers' databases. The information can be correlated across all sources by user-selected criteria for status or analysis. It can also be formatted and

extracted for use by other systems, such as BIFRS-W for decision support and QLM for updating status of retail requisitions.

b. Wholesale Level Task

Balanced Inventory Flow Replenishment System – Wholesale (BIFRS-W) - to minimize system-wide costs by balancing the flow of supply chain inventories and leveling production workload using constraints management. Manufacturers will be provided cut schedules based on current demand versus long term forecasting models.

c. Retail Level Task

Quality Logistics Management (QLM) at MCRD-SD – to provide an automated support for logistics operations at the retail level including key functional components supporting supply requisitioning, receipt processing, inventory management and supporting and tracking customer issues. QLM provides automated interfaces to legacy systems for order tracking and financial reporting and the predictive forecasting capabilities use balanced inventory flow concepts to meet seasonal fluctuations effectively.

Balanced Inventory Flow Replenishment System - Retail(BIFRS-R) at MCRD-PI - to provide an automated ordering system that balances retail inventories and flows replenishment requisitions into the wholesale system.

d. Manufacturing Level Task

Defense Apparel Manufacturers' Web Tool (DAMweb) – near-term capability employing web based technologies that support the real-time capture of snapshots of finished goods and work-in-process inventory levels for use by supply chain managers. Each of the DAMs has their own web page that contains lists of NSNs, organized by PGCs, for garments that they have been awarded a contract to produce. They use these lists to enter status information that can be reviewed by the supply chain managers in real-time by accessing the same web pages or collectively through the daily collection of all pertinent information in the AAVS DataMart.

ARN Apparel Information Management System (ARN-AIMS) – an optional task that will automate DAM's inputs and eliminate manual data entry. The system will be designed to be an integral part of each DAM's order receipt and processing, status tracking, shipping, invoicing, and raw material and finished goods inventory management. Pertinent DAM information can be extracted from

each DAM's ARN-AIMS database for use by supply chain managers through either the AAVS DataMart or the DAMweb viewer.

III. STAKEHOLDER OBJECTIVES

Following are specific objectives of different stakeholders based on formal guidance and discussions. These objectives guided the ARN Team's investigation, development of evaluation criteria, and analysis of alternate courses of action.

A. Ft. Leonard Wood Objectives

The mission of Fort Leonard Wood's (FLW) Clothing Initial Issue Point (CIIP) is to deliver the highest quality, best fitting clothing to their soldiers ("war fighters"). They must have complete issue stocked and ready to support the training center's mission and to avoid (at all costs) going out-of-stock on any item.

The following objectives were gathered during discussions with Ft. Leonard Wood personnel. These were reviewed at the summary out-briefing presentation.

- Transfer Inventory Accountability
 - Issue All Clothing on First Recruit Pass
 - Obtain Predictable, Consistent Mechanicsburg-type support
- Maintain High Level of Operational Quality:
 - More items at Mechanicsburg
 - More Bill & Hold
 - Less Quick Response
 - Timely Transaction Postings
 - Data Reliability
- Achieve Improvements
 - Obtain Efficient Visibility of Requisition Transactions
 - Reduce Time Required for Daily Reconciliations
 - Consolidate Operations & Reduce Space
- Implement State-of-the-art Systems and Procedures
 - Equipment
 - Technology
 - Management Practices

B. TRADOC Objectives

The following objectives are based on previous discussions with TRADOC personnel and from comments gathered during the Project review activities at Ft. Leonard Wood.

- Implement ACIIPS-R
- Obtain Predictable, Consistent Support
- Reduce Space and Consolidate Base Operations
- Increase Operational Efficiency
- Explore Alternative Inventory Management Processes
- Optimize Support to War Fighters
- Lower Inventory Costs
- Interface with Army Legacy Systems
- Changes recommended should not affect military staffing, i.e., no reductions-in-force

C. DSCP Objectives

The following objectives were the ARN Team's understanding of the objectives of DSCP based on previous input and discussions during the on-site review activities.

- Assist Army in Reducing Inventory Investment Through DLA Inventory Ownership, Automation, & Modern Replenishment Practices
- Design New Processes for Efficient Roll-Out to Other Sites
- Prove New Designs at Ft. Leonard Wood

D. DLA Objectives

The following objectives are based on the SOW and previous discussions and input received from DLA project management.

- Implement and Demonstrate ARN Concepts to Reduce Total Supply Chain Inventories including:
 - Total Asset Visibility
 - Full Automation
 - Balanced Flow
- Prove Concept & Processes for Effective Transfer to Other RTCs

IV. ARN TEAM SUMMARY FINDINGS

A. Observations of Training Cycle

The entire basic training cycle is a short 8-week period and there is no time to wait around until a soldier can get a critical part of his/her initial issue. These soldiers are on a strict time schedule from the point of departure (MEPPS Station) to Basic Training Center (BTC) to their Advanced Individual Training (AIT). If a soldier is a reservist or National Guard and is on active duty (on orders) for any consecutive 180-day period, they are considered Veterans and guaranteed costly benefits from the government.

According to a FLW representative, a large percentage of every female training cycle does not pass weapons qualification before the 5th week of the cycle. The fifth week is when Phase II issue is distributed and it causes unnecessary surges on the issue line when an extra truckload of soldiers show up to be fitted during another cycle's dedicated time. This issue causes major consternation between the Automated Clothing Initial Issue Point (ACIIP) system and the military and is an area that should be examined for a solution.

B. Summary of Site Visit Observations

The following bullets summarize the key findings and observations of the ARN Project Team.

- Facilities:
 - Fragmented
 - Well Maintained & Managed
 - Potential for Different Configurations
- Personnel:
 - Very Knowledgeable
 - Highly Motivated
 - Cross-Skilled & Very Flexible
 - Well Organized & Managed
- Inventory Accuracy Very High:
 - Attention to Detail
 - Accounting Validation
 - Currency of Postings
- Information Systems:
 - Functional But Dated

- Inventory Draw-down Requires Better Tools
- Major Hardware & Software Upgrades Underway
- Lost Transactions
- No ASCOT Linkage for Speed
- No SAMMS Linkage for Efficient Status
- Unresolved Interface Issues Between ACIIPS, SARSS, STARFIARS-M, STANFINS
- Manual SARSS Disk Generation

The following information summarizes the key issues/needs/desires of various individuals that were reported to, or discussed with, the project team:

- Major General (2-star) Robert Fowler (Post Commanding General):
 - Wants CIIP to "apply modern business practices"
 - Incorporate "high-tech" solutions
 - CIIP must have all issue items on hand at all times...period
 - Support the war fighters
- General Comments from Supply & Services Division Chief
 - "Consistency" and "Predictability"
 - "Confidence is Key" - knowledge that re-supply will arrive on time via dedicated trucks
 - No out-of-stock items
 - Apply modern business practices/high tech solutions
 - Bar coding for inventory, updated software for receipt and critical reports generation, applicable hardware, etc.
 - Eliminate human error
 - Reduce reconciliation time (personnel spend too much time balancing the dollar value in ACIIPS to what the supply side reports show)
 - Free-up employees to increase support for "core competencies"
 - Improve order-ship time ("hours, not days") with real time information
 - Emphasis on "velocity management"
 - Reduce dollars in the supply chain pipeline and asset visibility
 - Key objective is "Same-day-receipt-process"
 - DSCP takes ownership of all wholesale inventory up to the point of sale.
- Other Observations and issues include:
 - MG Fowler is aware of the ARN Review interested in the outcomes

- MG Fowler recently come from a tour at the Pentagon and has an open agenda to bring FLW into the 21st century by applying technology and modern business practices to Ft. Leonard Wood's respective missions
- TRADOC will have to be a willing participant in anything involving "ACIIPS"

V. AREAS AND FUNCTIONS REVIEWED

The ARN Team reviewed the following areas and personnel activities during the on-site activities. These included all of the elements of the Clothing Initial Issue Point operations in support of Recruit Induction Center activities.

A. Inventory and Warehouse Operations

1. Processing Volumes and Timing

The Fort Leonard Wood RTC reportedly processes 25,000 soldiers per-year. Of these, roughly 70% are male and 30% female. As at other recruit induction centers, the busiest period is summer (June, July, August) when 40% of the year's total of troops are processed. The slowest time is during the winter months, especially through the holidays.

The schedule for recruit processing was reviewed with the ARN team. Day 1 for Phase I issues at the Reception Battalion can be any day, but Thursday, Friday and Monday are the heaviest days. Phase 2 occurs during the 5th week of training on a DPTM schedule with 30 days advance notice, but recruits can arrive anytime. Graduation from the Recruit Training program occurs at the end of the 8th week. Personnel noted they adjust the Shipping Plan information entered into ACIIPS based on "local knowledge," i.e., years of experience. During the summer months, orders are adjusted in anticipation of the "Summer Surge".

2. Clothing Inventory Organization and Flows

The clothing issue for these troops is warehoused in 3 buildings: the Phase I warehouse (red brick), Building 2320 (Male Phase II Issue), and Building 2323 (Female Phase II Issue). The Male Phase II Issue is located in Building 2322 and Female Phase II Issue is located in Building 2324. Alterations are done in the Phase I warehouse for male/female Phase I Issue, and in Building 2321 for Phase II male, and 2324 for Phase II female.

Ft. Leonard Wood personnel and ARN Team members noted that the existing space management plan in each of the (3) Phase 2 warehouses – as well as the Phase 1 building – could be greatly improved. The warehouses each have bulk/boxed items, some palletized, that are arrayed in lengthwise rows. The main warehouse area for the Phase 1 Support activities is equipped with racks for pallet storage, although it was noted by personnel that many items are received in less than pallet load quantity and require hand stacking in designated storage areas.

The Phase II items were not stacked more than 6-7 feet high and these were box on box, with no use of stacked pallets or framed shelving. Some of the CIIP space was being used by the CIF, which controlled the warehouses that run parallel to their warehouse along the railhead. Other space was taken up by old, turned in and defective items. The project team was informed that some of the "obsolete" stock had been there for two or more years. In one warehouse, there was a stack of wooden pallets that rose nearly to the ceiling. These were also the property of the CIF.

Furthermore, the actual condition (i.e., age and materials) of the Phase II warehouses could be considered sub-standard to today's warehousing standards. These are wood construction with minimal climate control. Only a small portion of each building is heated and there is no air conditioning. These conditions limit the utility for storage of different types of inventory and adversely affect the morale of warehouse personnel.

3. Observations on Receiving and Warehousing Operations

The Ft. Leonard Wood staff recently revised inventory stockage levels to reduce inventory in recognition of the improved service from the Mechanicsburg Depot. A dedicated truck results in an estimated 10 day reduction in order-ship time (OST). FLW is now replenishing inventory every day – material requisitions go through CTAS to SARSS to DASC. Key points of operations are summarized below.

a. Mechanicsburg to Warehouse to Phase Lines

- Dedicated trucks arrive at the Ft. Leonard Wood Phase I Warehouse on Mondays and Thursdays. Credit was given to Jeff Roessler at Mechanicsburg for providing excellent support.
- These shipments represent 80 percent of the total, with most being delivered on Thursday.
- Ordered items are shipped mass-palletized and are not separated by item or Phase Line. As a result, the shipments must be broken down by hand and delivered to their designated storage destinations.
- The method of transportation on Ft. Leonard Wood between Phase I and Phase II warehouse facilities is a military truck with a civilian driver. This driver works a four-day week.
- When shipments arrive at the Phase II Warehouses they are received by one single warehouseman (Doug Warren). He moves the items with

forklift, handcart, and dolly to dedicated areas within the respective warehouses.

b. Other Shipments

- Of the other 20 percent, 15 percent arrives from other sources (direct manufacturer ship) to the Phase I Warehouse and 5 percent going directly to the Phase II Warehouse.
- Some shipments arrive direct from vendor, but they are unscheduled.

c. Warehousing and Accountability Forms Used

- DD Form 1348-1, DoD Single Line Item Release/Receipt Document
- TRADOC Form 248-R Clothing Worksheet
- DD Form 250 Material Inspection and Receiving Report
- SF 364 Report of Discrepancy (ROD)
- Distribution Standard System Final Truck Manifest (from Mechanicsburg)

4. Comments on Space Use Alternatives/Objectives by Supply Services Personnel:

During discussions and briefings with base personnel, the Chief of Supply Services and staff provided several comments with regards to current operations. These are summarized as follows:

- They emphasized the *difficulty* that separating the bulk “warehouse” inventory from the stock in the issue line would cause. The personnel are used to *pulling stock from inventory on an as needed basis without documentation* and *ACIIPS does not provide for multiple inventories*.
- It is not Ft. Leonard Wood’s objective to simply free-up old buildings for demolition although it may be a TRADOC’s objective to consolidate space to free up old buildings for demolition.
- Jim Allen commented that, “...Ft. Leonard Wood’s motivation to eliminate space is zero.”

- Ft. Leonard Wood would be interested in upgrading the phase lines with flow racks, more efficient bins and counter space, etc., however, funding for this is very limited.
- A plan that has been on the books for nearly 20 years for construction of a storage center combining the CIIP, CIF, etc. into a single supply center. This project would be funded with Military Construction funds.

5. Comments on Depot Support:

During review of operations, it was conveyed that due to Ft. Leonard Wood's satisfaction with the relationship with Mechanicsburg's dedicated-delivery support, shipments to FLW are rarely checked for accuracy on the loading dock. When discrepancies do occur, personnel rely on a logbook that "Mr. Warren has been keeping for ten years."

Ft. Leonard Wood personnel claimed they could reduce the inventory further than at present if 100% of were provided from Mechanicsburg.

6. Comments on Possible CIIP/CIF Merger

The Chief, Supply and Services Division, stated that TRADOC has studied combining the CIIP and CIF functions in existing space. The major concerns are: 1) Cost of clothing allowance to the individual soldier; and, 2) What CIF items would be included in permanent issue. While this has been included into the Army's "Master Plan" it was unclear how important it actually is to the Army.

B. Phase Line Issue Processes – Common Practices

1. Phase Lines

Ft. Leonard Wood (FLW) has three clothing issue lines. Phase I is located in the recruit reception processing building and consists of all PT clothing, underwear, and field clothing. Both males and females use the same issue line, but at different times. Phase II is located in a different area a short drive from Phase I and consists of all dress clothing.

There are two Phase II lines in adjacent buildings, one for males and one for females. Males and females are processed at different times so the same Phase II fitters can operate both lines.

2. Issue Stations

Each issue line is broken down into stations with one or more garments per station. Counters separate the recruits from the issue bins. Fitters check the fit of their items at the end of their issue stations. Some stations have special fitting platforms as required.

Phase I Stations have "Selectaflow" flow-down case racks of varying frontage sizes. These racks normally hold 4 standard size cases in depth and 4 in height. Issues are made out of the front case. Only one case is open at a time. Most Phase I Stations have additional fast moving inventory stacked on the floor just behind the flow-down racks. They also have single-cell bins with 16 bins on either side of the flow-down racks.

Phase II has no flow racks. Single-depth bins and hanger racks are used instead. In all cases bulk storage is directly behind the issue stations. Additional back up bulk storage is also used for Phase II items.

3. Fitters

Permanently assigned civilians whose primary responsibility is to properly fit the recruits run each station extremely well. One civilian fitter is responsible for everything within his or her station. Each fitter fits recruits sequentially in small groups and handles all miscellaneous transactions. They accurately determine the size garment for the recruit, pick the garment from the issue line behind the counter, and have the recruit try the garment on. They then carefully check the fit, select other sizes if required, and mark for alterations as required. Finally they record the size garment actually issued on the Clothing Worksheet.

4. Restocking Issue Bins

Fitters are responsible for restocking their issue lines as required. This is done mostly at the end of the day after issues are completed, but is also done at every opportunity during the day. No paperwork is required for restocking. They also process other transactions such as zero lists, exchanges, and replacements. Finally, they readily perform other

functions such as sewing and assisting other fitters to eliminate bottlenecks in the issue process.

5. Recruit Labor

Recruits are used to assist with labor tasks such as moving issued items from one processing station to another and cleaning up hangers, boxes, etc. They are not used in any critical issue or restocking processes.

C. Phase I Issue Process:

In the Phase I Recruit Processing Center, each soldier is issued all clothing needed for weeks 1-5 of his or her respective training cycle. The soldiers are held in the nearby reception station for 4 days where they undergo administrative processing. Uniform issue is one of the first stops, just after haircuts.

1. Prepare for Recruit Arrival

Recruits arrive on day 2 of their 4-day induction processing cycle. The Clothing Initial Issue Point (CIIP) Supervisor receives three (3) reports each day that they use to prepare for the arrival of the recruits. These include:

a. Daily Expected Recruit Forecast

This report shows the number of recruits that arrived by week for the past and current quarters, the forecasted arrivals by day for the next 30 days, and the forecast by week for the next 4 quarters. It is in spreadsheet format and is used to plan short and long-term workloads on the issue line.

b. Hotel Roster Report

This is a daily report listing all the recruit information required for the Phase I issue. It is received on Day 1 prior to the arrival of the recruits on Day 2. Key data includes the roster number, line number, name, SSN, Component, and sex.

c. Clothing Worksheet

A clothing worksheet, TRADOC Form 248-R dated Dec 83 is provided for each recruit. A label with key recruit information is attached to each worksheet. The form is preprinted with a line for each item to be issued and there are columns for

actual quantities and sizes issued. This line number is a key within ACIIP and is the equivalent to DSCP's procurement group code or PGC.

d. Action Before Recruits Arrive

The roster is used to make the name tapes and plates and is input into ACIIP. Kits of belts, buckles, and other non-sized items are placed in recycled plastic bags.

2. Station 1 - Orientation

Recruits arrive on day 2 by roster number and are assembled in the orientation room. The process is explained and the Clothing Worksheet is issued.

Next, PT shorts, brown t-shirt, athletic socks, kitted items, and the laundry bag are issued. Recruits change into the issued clothing and place their civilian clothing in the laundry bag. They record their roster line number on the bag.

Foot sizes are determined on a mechanical reader and measurements are taken of head sizes. These two sizes are recorded on the Worksheet. They then proceed through the other issue stations beginning with Station 2.

3. Station 2 – PT Clothing

Sixteen flow-down bins are used for all PT items and the barracks bag. Each bin is 4 cases deep. Items are placed in the barracks bag.

4. Station 3 – BDU Trousers

Thirty-two flow-down bins plus 32 single bins are used to issue the tropical and temperate BDU trousers. One pair of trousers is worn and the other three are placed in the barracks bag.

5. Station 4 – BDU Coats

Twenty-eight flow-down bins and 32 single bins are used to issue the tropical and temperate BDU coats. Coats are placed in the laundry bag.

6. Station 5 – Cold Weather Coats

Twelve flow-down bins plus 16 single bins are used here. Coats are placed in the laundry bag. After this station the laundry bags are dropped at sewing. Name tapes will be sewn on the coats and the bags will be positioned for pick up by the end of day 2.

7. Station 6 – Gloves, Inserts, and BDU Caps

Twenty-three flow-down bins are used here. Recruits place their hands in drawings on the counter to determine glove sizes.

8. Station 7 – Underwear, Socks, and Towels

Twenty-four flow-down bins are used here. Towels are stacked on the counters.

9. Station 8 – Combat Boots

Sixty-nine flow-down bins are used for the one style combat boot. Two fitters man this station and each works from an identical set of bins of fast moving sizes so they do not have to cross each other often.

About 15 recruits are fitted at one time on a raised platform in front of the flow-down bins. Each recruit walks in the boots for about 2 minutes before final size is determined.

10. Station 9 - Accounting

Recruits are queued into groups of 24 after Station 8 and called into the “shakedown” room. They give the Worksheets to the Phase I Supervisor (or another civilian) as they enter the room.

While the shakedown is underway under the direction of a NCO or civilian, the Supervisor keys the issue into ACIIPS. He/she selects the roster and recruit line number.

ACIIPS presents an automated version of the Worksheet for the recruit on the screen. The data entry clerk verifies the component that ACIIPS uses to display the quantity authorized and issued. The clerk then keys in the sizes issued and shortages.

Zero lists are collected and filed. This takes 30 to 45 seconds per recruit. The Clothing Record is printed in multiple copies as soon as each worksheet is completed. All 24 clothing records are completed just before the shakedown is completed.

The Supervisor then assists with collecting the signatures and staples the Worksheet to the Original Clothing Record. The 24 recruits are out of the accounting process in about 22 minutes.

The Supervisor later double checks the Worksheet against the Clothing Record and corrects any errors. If errors are discovered, new Clothing Records are generated and distributed. At the end of the day, the Supervisor runs the daily ACIIPS closure process.

D. Phase II Issue Process

1. Station 1 – Shoes

A group of eight recruits are measured and seated on an elevated platform. Each is fitted individually. Storage for the shoes is open shelves in an "L" arrangement around the raised platform. One fitter is at the station.

2. Station 2 – Gloves

Recruits are fitted one by one. Stockage is kept under the counter in boxes. One fitter is at the station.

3. Station 3 – Short Sleeve Shirt

Recruits try-on and are fitted one by one. Stockage is kept in open shelves facing each other behind counter. One fitter is at the station.

4. Station 4 – Long Sleeve Shirt

Same as Station 3.

5. Station 5 – Slacks

Same as Station 3.

6. Station 6 – Mark Slacks Hem

Same as Station 3. The slack hem is marked for a temporary hem and left at the station. An alteration tag is stapled to the garment. The item will be returned to the recruit at the dress coat fitting.

7. Station 7 – Skirt

Same as Station 3.

8. Station 8 – Mark Skirt Hem

Same as Station 6. One fitter is at the station.

9. Station 9 – Coat

Recruits are fitted one by one. The jackets are on hangers on long hanging rows. Nametags are attached for alterations/pressing. The hangers are put in boxes. One fitter is at the station.

10. Station 10 – Overcoat

Same as Station 9.

11. Station 11 – Cap

Same as Station 3.

12. Station 12 – Accounting

Same as in Phase I. Recruits wait in the orientation room until the computer generated Clothing Records are ready to sign.

13. Station 13 – Fit All Garments

Return to orientation room to fit coat, slacks, and skirt. Final alteration markings are made and garments will be completed in 5 days.

E. Summary of Phase I and Phase II Differences

The ARN Team observed minor differences between Phase I and Phase II processing. The Department of the Army (DA) DA Form 3161 Request for Item Issue of Insignia Items is received 2-3 days before the recruits arrive. Recruits arrive by company. Manila nametags are issued in orientation for marking items for alterations.

F. Clothing Turn-in Process

All turn-ins are received at the CIF's Clothing Reclamation Facility (CRF). New or like-new items are sent to the CIIP. The CRF collects garments in laundry baskets by style and prepares a DA 2765 with one valid NSN for the turn in of all garments of the same style. Items are then transferred to the CIIP.

The CIIP validates the count and segregates by size. They then record the size and quantity on a local form and attach it to the DA 2765.

The Phase Line supervisor keys in the turn-in by item and size, generates a printout, and attaches a turn-in printout to the 2765 and detailed list for audit trail purposes.

G. Clothing Exchange Process

Recruits are permitted to exchange like items in order to get the proper fitting garment. A locally produced "Clothing Exchange Worksheet" is completed by the fitter and used by the Supervisor to correct the ACIIPS balance.

H. Clothing Replacement Process

The unit commander authorizes clothing replacement on a DA Form 3078, Personal Clothing Request. The recruit presents the form to the fitter who verifies the need, collects the old item, and issues a replacement. The fitter completes the form by entering the size and quantity issued.

The supervisor keys the transaction into ACIIP from the 3078 to deduct the assets from the inventory, prints a copy of the transaction, and files a copy of each document for an audit trail.

I. Special Measurement Process

FLW has very few SM orders with almost none coming from Phase I. The fitter takes the measurements, completes the manual paperwork, and forwards it for data entry.

J. Quality Deficiency Reports

Quality Deficiency Reports (QDRs) are completed for items with quality problems. The items are held in special locations for each Phase Line.

The commercial warranty on the combat boots was reported to work extremely well, and it was recommended that this model should be considered for all items. Problems are resolved on the boots within two weeks with minimum administrative work by the CIIP.

VI. INFORMATION MANAGEMENT SYSTEMS

This section provides summary information on the various aspects of the information processing activities supported by ACIIPS. Included are overviews of system architecture and daily and monthly processing activities and metrics.

A. Information Systems Overview

1. Personnel Organization

Several personnel support current operations with two primary divisions under the CIIP Manager of Clothing and Issues. One individual serves as the supervisor/item manager for operations and accounting and two other individuals serve as lead data entry personnel overseeing the key data entry of information on issues into ACIIPS. The supervisor of the accounting functions ensures requisitions and receipts are processed in a timely manner.

There are 12 support staff members involved in CIIP issues and operations. Team members were informed that the CIIP operation would be in deep trouble without the support of "free" labor from permanent party, casual and holdover/recycle soldiers. Unfortunately, the ACIIP support gets last pick of these personnel at Ft. Leonard Wood because of the constant need for KP duty and Base Beautification. As a result, information systems and routine data processing is an area that can certainly be considered for the introduction of "modern business practices."

2. Financial Information Systems Interfaces

Financial systems were recently upgraded, and several operational issues are still being worked out. The STANFINS (Standard Financial Management System) is in the process of being replaced by the SARSS (Supply Army Retail Supply System) and STARFIARS MOD (Standard Financial Inventory Accounts and Reporting System – Modified). SARSS was initially installed in June 1998. STANFINS is still in use, but plans call for this legacy system to be completely replaced by the STARFIARS-M.

The primary interface is from ACIIPS to SARSS for requisitions, receipts, and billing transactions. SARSS in turn transfers requisition information to SAMMS and financial information to STARFIARS-M for general ledger financial reporting.

3. Current ACIIPS Architecture

ACIIPS was initially fielded in the early 1980s to support Clothing Initial Issue Point activities at Army Recruit Induction Centers. The system initially operated on IBM System 34 and 36 mini-computers with linked terminals. The system was upgraded in the early 1990s to the present configuration. Currently the base is using Banyan-vines and is migrating to Microsoft NT.

In the present environment, ACIIPS is run off of a mini-computer (IBM AS400) maintained and operated by the base DOIM (Directorate of Information Management). This computer is not net-worked to the supporting three (3) data entry terminals located in the Phase I and Phase II operational areas except by dial-up land lines and modems from the RIC processing areas back to DOIM located in building 631.

The ACIIPS equipment used by computer operators to enter recruit information and items/sizes issued includes Zenith 386 Computers and Mannesmann Tally 645 Printers at both of the phase line processing areas. Personnel indicated printing, separating, and distributing the large inventory sheets takes time to complete. During the 3 consecutive iterations witnessed, there were 3 separate individuals (2 civilian, 1 army) who ran the soldiers through the data entry process in Phase I, with a comparable level of support provided in Phase II.

4. Future ACIIPS-R Architecture

During the past 3-4 years, TRADOC has been working on a major upgrade to the ACIIPS application software. This is now in the final stages of testing and has been installed at Ft. Jackson. Reports indicate that there have been some hardware problems encountered at this initial test site.

The future ACIIPS-R architecture will replace the mini-computer and linked terminals with Microsoft Windows™ NT Client/Server based architecture. This new system will also use the contemporary standard Windows 98 operating system supported by standard Hewlett Packard DeskJet and Laser Jet printers that use plain paper for reports.

The new system is designed to be Year 2000 compliant and provides a "windows graphical user interface" (GUI) environment. The plans call for the server to be installed departmentally, i.e., at the CIIPS, rather than at the DOIM, although at Ft. Leonard Wood, the server is to be installed in a central server nest at new DOIM facilities. DOIM will continue to run the daily back-ups.

In addition, plans call for remote modem access to be provided for accessing ("pulling") SARSS and RECBAS information into ACIIPS-R if there is not a direct (i.e., hardwired)

link to the base LAN (Local Area Network). At Ft. Leonard Wood, the cabling has already been installed to provide direct linkage to the DOIM "Server Nest."

The ACIIPS-R functionality will add ability to access historical data on-line as well as enhanced reporting to DSCP and MACOM. The intent is to increase reporting capabilities on an as needed basis. This includes interfaces to SARSS and STARFIARS-M as well as the ability to receive recruit data directly from RECBAS, the data base system supplying individual recruit identification information (i.e., name, rank, dates, component – i.e., regular Army [AA], National Guard [NG], Reserve [RS], etc.).

ACIIPS-R will provide numerous improvements over the current functionality. These include:

- Historical Data on Issues to Soldiers
- Historical Data on Receipts
- Enhanced Reports and On-Line Information
- Manager Control over Report Generation
- Visibility of Activities to MACOM
- Maintains Dues-Outs to Soldiers
- On-Line Help Function

TRADCOC has developed a comprehensive implementation plan and training requirements to field ACIIPS-R. The changes in the application and operating environment require a significant amount of training, although the base functionality is maintained from ACIIPS to ACIIPS-R. Also, the future systems will require change in record keeping and file storage.

B. ACIIPS Information Systems Processing

The following bullets summarize the key elements and observations of current ACIIPS processing:

- ACIIPS to SARSS data transfers are done with 3 ½ inch floppy disks and "sneaker power."

- Transactions are in standard MILSTRIP format including AOAs.
- Staff noted that there is a "bug" in the SARSS program that results in some orders being lost. This is related to "CQ's status - Cancel Quantity" on MROs and is thought to be coming from ACIIPS to SARSS manual "sneaker power" interface.
- Spot inventories are conducted and semi-annual official inventories allow for only +/- 1/2% by dollar variance for 6 months of issues.
- Boots are not vendor managed.

1. Beginning of Month Processing:

At the beginning of each month, the "shipping Plan" information is entered into the system to generate the requirements for the month following the current month. FLW personnel indicate they extract information from RECBAS for this and make adjustments based on their personal knowledge of what they can expect to actually occur.

2. Daily Processing:

The following sequence of events occurs on a daily basis as part of routine ACIIPS operations:

- Beginning of Day
 - Change date
 - At Reception Battalion, recruit names and other data are retrieved manually from the RECBASS and keyed into ACIIPS
 - Recruit Labels are generated and placed on Issue Worksheet for use subsequently in recording specific issues to individual recruits
- Processing throughout Day
 - Issues and receipts entered throughout day (Computer entry per-soldier takes an average of 45 seconds including data fields: Name, Size, ACIIPS Line Item, Soldier's Roster/Line number)
 - Exchanges entered as received
 - Cancellations entered
 - Follow-ups
 - Manual AOA's entered
 - Price Changes (usually entered one time per year)

- Bulk issues (over the counter (OTCs) in bulk to a unit)
- Updates to SLC, RO, RP, SL, U/I, U/M basis flags, etc.
- Inventory adjustments (for scheduled inventories or spot checks)

- End of Day Processing –
 - 1530 - Call to DOIM - Do backup Request
 - DOIM completes ACIIPS backup to tape drive
 - DOIM calls back to inform CIIPS back up done – call logged
 - 1545 - Backup notification logged , DOIM cycles tapes
 - 1550 - Replenishment Cycle - generates A0As
 - 1600 - Run end of day reports, reports printed - 3 copies in NCR paper - Original to CIIP Accounting Supervisor to file, one copy to trash, one copy broken down to registers and distributed for validation of days processing

- End-of-Day Report Processing – The following activities occur as part of Daily Cycle (DACY) processing:
 - Request phoned to DOIM for Job #8 – This generates a file to download to floppy disk
 - The floppy disk file is then edited using DOS Edit to modify Receipts including Z6Ts, S9Ts
 - Data on floppy also includes A0As – requisitions – generated at end-of-day, and ZM1s - issues
 - AY9s are not included in this floppy disk file, these have to manually input to SARSS
 - FLW CIIP Accounting personnel modify data on disk (change fund code in A0A, D6S AY9 changes to D6S S9T, also change W5BCIIP account)
 - Disk in hand carried to Central Receiving for data file input to SARSS (sneaker power)
 - Documents numbers are generated
 - ZM1s pass through SARSS to STARFIARS-M to Ft. Benjamin Harrison, and then to Ft. Sill, Oklahoma, for posting to the DODAC for individual states for charge back of Reserve and National Guard issues
 - Z6Ts, S9Ts are processed in SARSS for posting to STARFIARS-M for financials

- ACIIPS takes historical data to generate order ship time (OST) based on history of past orders
- ACIIPS takes demand history to recalculate Requisition Objective (RO) and Reorder Points (RP), but there is no calculation or recommendations for safety level

- Documents Numbers are assigned according to the following blocks:
 - 0001 to 0999 – Automatic by ACIIPS
 - 1000 to 1999 – Manual use for ESOC
 - 0500 to 0599 - for special measurement orders
 - 2000 Series - Manual orders
 - 9000 Series - Used for ZM1s
 - 8000 Series - ZM1 reversals
 - 9500 series is Manager initiated financials.

- End of Day Reports

End-of-Day Processing is concluded with the down-load of report information from the AS400 mini-computer via modem to the ACIIPS terminals and the End-Of-Day reports are run. These include:

- **Management Exception Report** – Used for Manager review
- **A0A Document Register** – Used for reference tracking of MROs
- **Manager Initiated Requisitions** - Used for reference tracking of MROs
- **Receipt Document Register – Part I: Z6T** – Reports are checked on the following day and matched to Form 1348 or DD 250 to validate receipts processed
- **Receipt Document Register – Part II: ISD** – Reports are checked on the following day and matched to Form 1348 or DD 250 to validate receipts processed
- **ZM1 Document Register (Regular Issues)** – Used to validate issues by detail of quantity or total dollars as required

- **ZM1 Document Register (Manager Initiated)** – Used to validate issues by detail of quantity or total dollars as required
- **ZM1 Reversal Document Register** – Used to validate issues by detail of quantity or total dollars as required
- **Daily Issue Sales Report** – Used to validate issues by detail of quantity or total dollars as required
- **National Guard Sales** – Used to validate issues by detail of quantity or total dollars as required
- **Management Data – Part I** – Information on on-hand supplies
- **Management Data – Part II** – Information on on-hand supplies
- **Management Update Report** – Information on Quantity and pricing changes, also audit trail on forecast data, and freeze flag changes, etc.
- **ZKB Price Change Report** – Price updates
- **AMA Document Register** – Provides information on requisition priorities and changes to priorities
- **AC1 Document Register** – Information on requisition cancellations
- **AF1 Document Register** – Used for follow-ups on requisitions

- On-Demand Reports - These can be run on an as requested basis before and after forecast and include:
 - **Retail Balance Report** – Provides stock status information including NSN, Nomenclature, Price, U/I, LN-NR, Size, QOH-New, QOH-Used, Qty-DI, RO, RP, SL, QI-D, QI-M (quantities issued daily and monthly), Demand-D, Demand-M, % Demand, Projected – CD, SLC, Class-CD, 0Balance-DTE, SL-DTE, Authorized Qty, OST, MA, MN, MR, FA, FN, FR (male and female by RA, Guard, Reserves), Loc-1, Loc-2, Loc-3, and RFF, IF, and NIF
 - **Dues-in Report** – Provides listing by document number

■ **Retrieval Report**

3. End-of-Month Processing.

The following activities occur as part of the end-of-month processing cycle:

- Forecast data input (clothing)
- Manager Update Report (includes forecast information for the month following the current month, i.e., weeks 4-8)
- Occurs on 1st day of month following close of business
- Same reports as daily processing cycle (DACY) plus additional reports including:
 - Manager Updates Report
 - Potential Excess Report (designed to identify excess to be turned in for others to use to stock record account)

4. Current System Needs and Problems:

There are several shortcomings with the current system. These were discussed with Ft. Leonard Wood personnel. It was indicated that the installation of ACIIPS-R would resolve many but not all of these issues.

- ACIIPS is not Year 2000 compliant
- ACIIPS does not provide for multiple inventories (can not separate bulk and phase line issue inventories)
- Timing and Reliability
- Order status review is not on-line
- Need capability to query by document numbers and NSNs
- Need transaction history (can only do manually)
- Inventory control is tight with only ½ of 1% variance allowed on total dollar sales of \$30,000,000 annually

- MRO generation for AFES, and ROTC units needs to be addressed
- Current problems reported with interfaces to SARSS was also reported by FLW personnel as occurring at other 4 recruit induction centers but also for other DA bases. (It was noted the problem may be from SARSS to STARFIARS-M, not from ACIIPS to SARSS).
- New software “Blast” is being installed to FTP files between ACIIP and SARSS. Blast is encrypted, but is not secure to level required by HQ and Ft. Monroe says no FTP use.

C. Inventory Processes

Formal inventories are conducted semi-annually. Different individuals make multiple counts until at least two counts match.

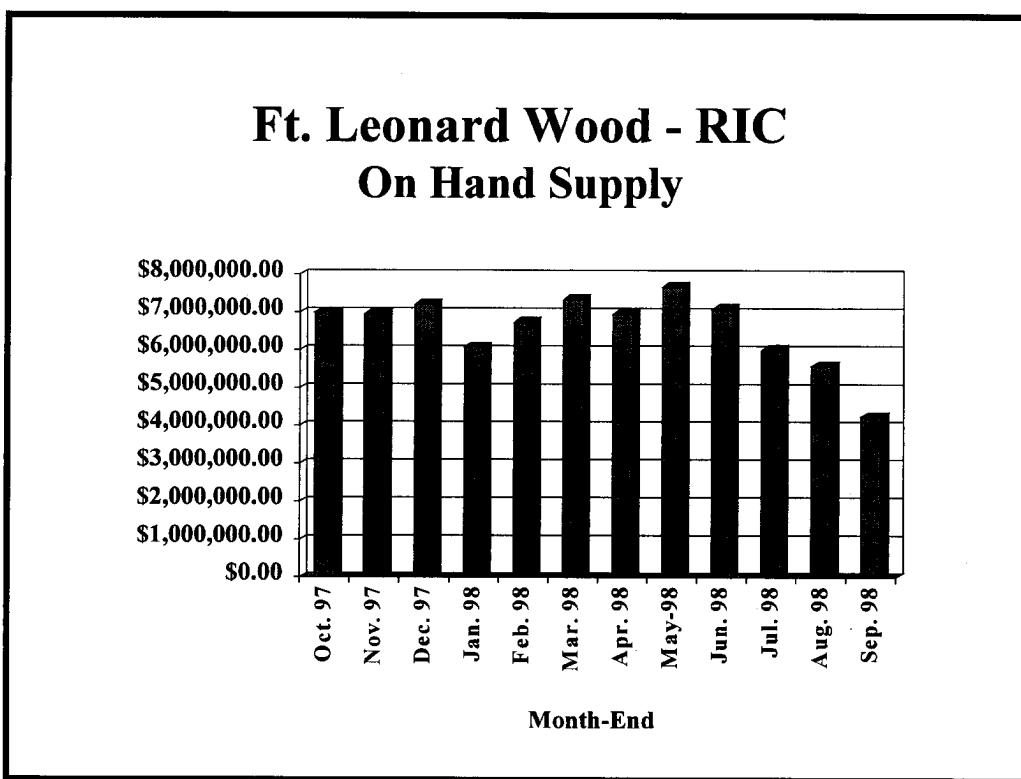
The counts are then compared to the ACIIP on-hand quantities. Differences are resolved by scrubbing the audit trail documentation. Once this is completed, the ACIIP Inventory Module is run to compute variances.

Allowable variances are one-half of one percent of sales each six months. There has never been any problem meeting this requirement. Informal inventories are conducted when a fitter feels his inventory is getting too low or there is an unexpected stock out. These problems occur infrequently and are normally resolved quickly with the complete audit trails that are available.

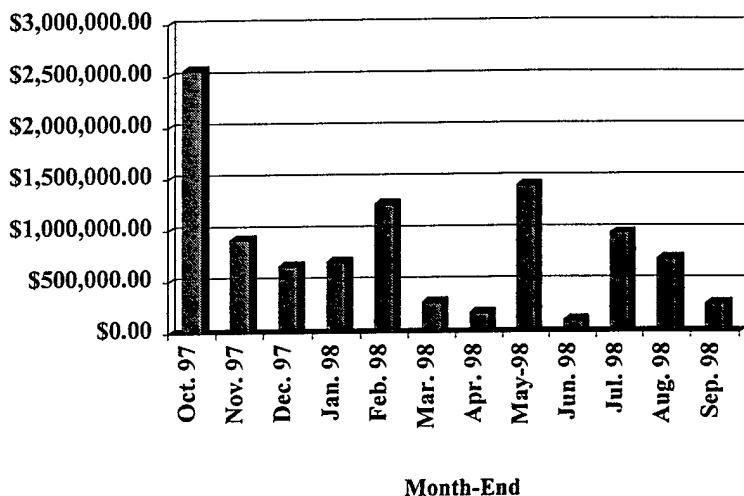
VII. Metrics:

A. Annual Metrics

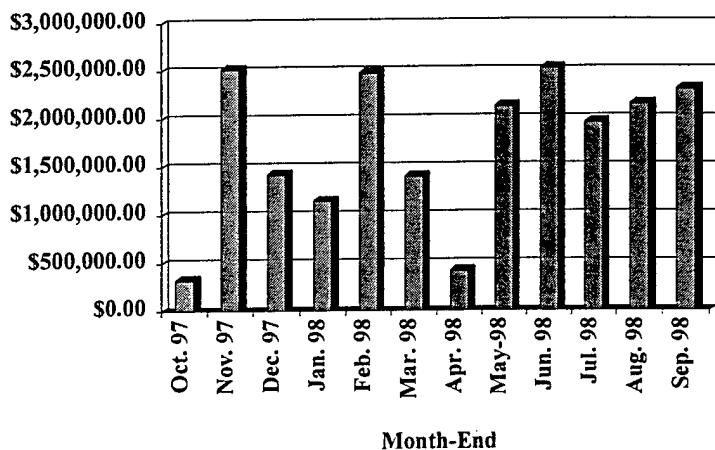
The following metrics summarize the annual volumes and status at the time of the site-visit.



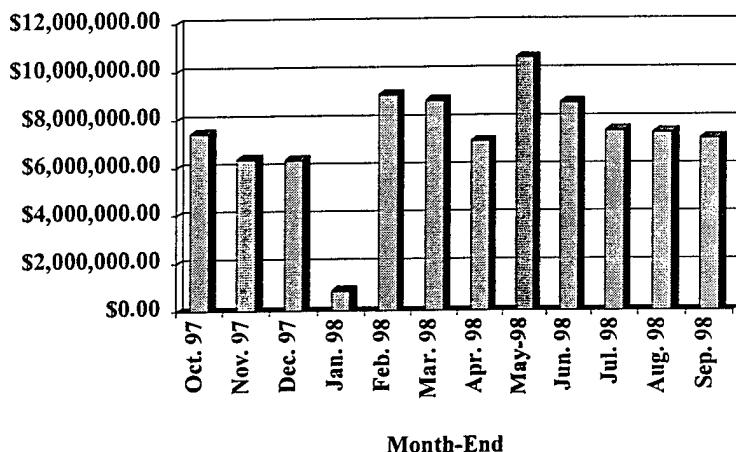
Ft. Leonard Wood - RIC Due In



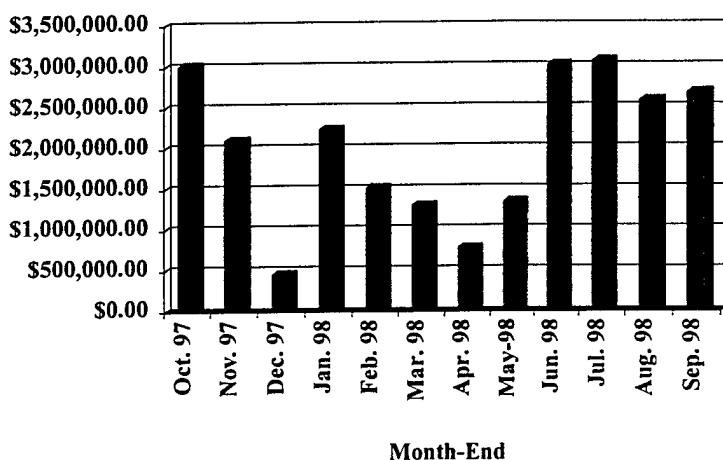
Ft. Leonard Wood - RIC Receipts



Ft. Leonard Wood - RIC RO Supply



Ft. Leonard Wood - RIC Total Sales



B. Metrics at Time of Site Visit

Status at the time of the site visit by the ARN Team on 22 September 1998 was as follows:

- Current on hand value \$4,874,608
- Current RO Supply \$7,173,594
- Current Due-In \$460,000

C. War Reserve Inventory Metrics

War reserve (or surge) stock is not held on the post. This is not part of the routine CIIP responsibility, therefore no information was collected with regards to the metrics for war reserves.

VIII. FUTURE VISION AND OPERATIONAL ALTERNATIVES

This section presents the various operational visions defined by the ARN Team. The Team defined three possible scenarios based on evaluation of current operations and ongoing efforts. This process identified three alternative approaches for the *two new scenarios*, as well as the first – or base line – scenario.

A. Future Scenarios

The first scenario was to continue present operations. The only difference in the short term is the completion of implementing the Automated (Army) Clothing Initial Issue Point System – Redesigned (ACIIPS-R) software and hardware. Under this scenario, Ft. Leonard Wood will continue to operate only with the ACIIPS-R capabilities once implemented.

The second scenario was based on splitting inventory ownership with DSCP owning the bulk assets and Ft. Leonard Wood continuing to own the issue line inventory. Under this scenario, only the fiscal accountability for bulk inventory assets would be transferred to DSCP. There were three alternatives identified for this scenario.

The third scenario was based on transfer of inventory assets to DSCP for both the bulk and issue line inventories. Under this scenario, the fiscal accountability for all inventory assets currently maintained at Ft. Leonard Wood would be transferred to DSCP. Ft. Leonard Wood specifically requested this third scenario. The same three alternatives identified for scenario two were duplicated for scenario three.

As noted, for scenarios two and three, the *new scenarios*, the ARN Team developed three options. These are as follows:

- **Option 1 – Enhanced ACIIPS-R**

This scenario provides for the addition of BIFRS-R (Balanced Inventory Flow Replenishment System – Retail) functionality to ACIIPS-R

- **Option 2 – QLM Local**

This option would provide for the full installation of QLM™ (Quality Logistics Management) System at the Recruit Training Center (RTC) with interfaces to ACIIPS-R at the site.

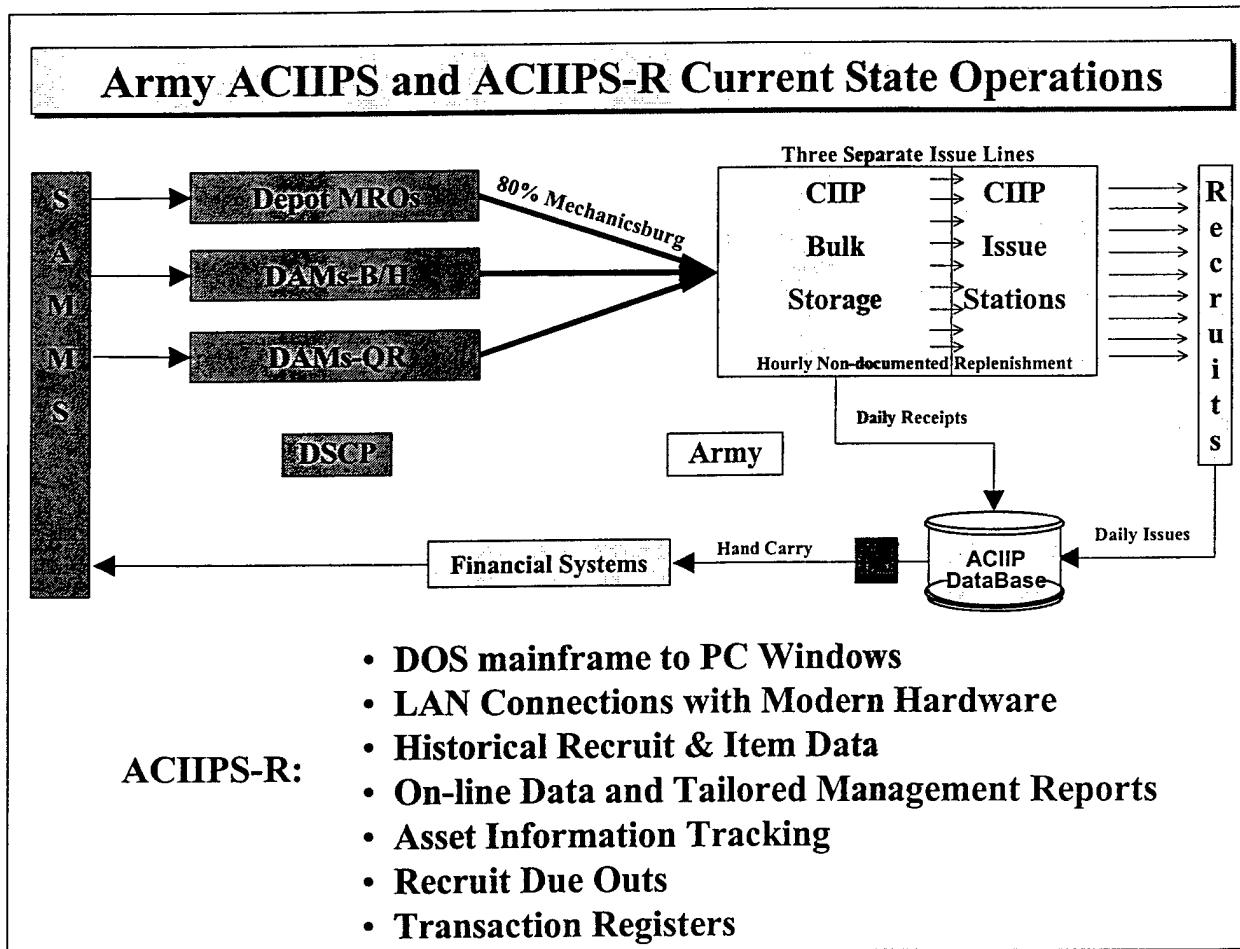
- **Option 3 – QLM Central**

This option would provide for a QLM server to be installed at the site to mirror the outputs of ACIIPS-R with a second QLM server to be installed at DSCP for

operational management and support of inventory replenishment at Ft. Leonard Wood by DSCP personnel. This approach would use a "host-remote" relationship with the DSCP Server acting as the host and the remote QLM Server at Ft. Leonard Wood service as a mirrored repository of the data transactions generated by the future ACIIPS-R application operated by Ft. Leonard Wood personnel.

B. Current State Operations (Baseline)

The following paragraphs describe the current state of operations for ACIIPS and the future ACIIPS-R capabilities to establish the baseline for comparison with alternative future state systems. The focus of each description is on inventory management. The following chart shows the functional flow of the baseline current state:



1. ACIIPS

Based on previous reviews of ACIIPS capabilities and information gathered during observations and discussions with Ft. Leonard Wood personnel, ACIIPS provides the following capabilities:

- Provides a weighted tariff based on historical issues
- Computes an RO, ROP and Order Ship Time
- Provides transaction registers
- Provides several standard reports documenting financial transactions

The operational tables (databases) for ACIIPS are erased at the end of each month and only limited information and parameters are carried forward, i.e., QOH, SL, Operating Level. Other parameters such as RO, ROP, and OST are recalculated each month. ACIIPS does not retain historical usage information, and personnel must manually extract data from hard copy reports for management analysis.

2. ACIIPS-R

Based on information gathered during discussions with Ft. Leonard Wood personnel and previous conversations with TRADOC and Ft. Monroe personnel, ACIIPS-R will provide the following capabilities and improvements over ACIIPS:

- Provides historical data on soldier issues
- Provides historical data on receipts
- Provides on-line information and reports
- Supplemental address can be changed by Manager
- Manager can decide which reports need to be printed
- CIIP personnel will control server
- Provides reporting directly to DSCP
- Provides visibility to MACOM
- Provides asset information tracking

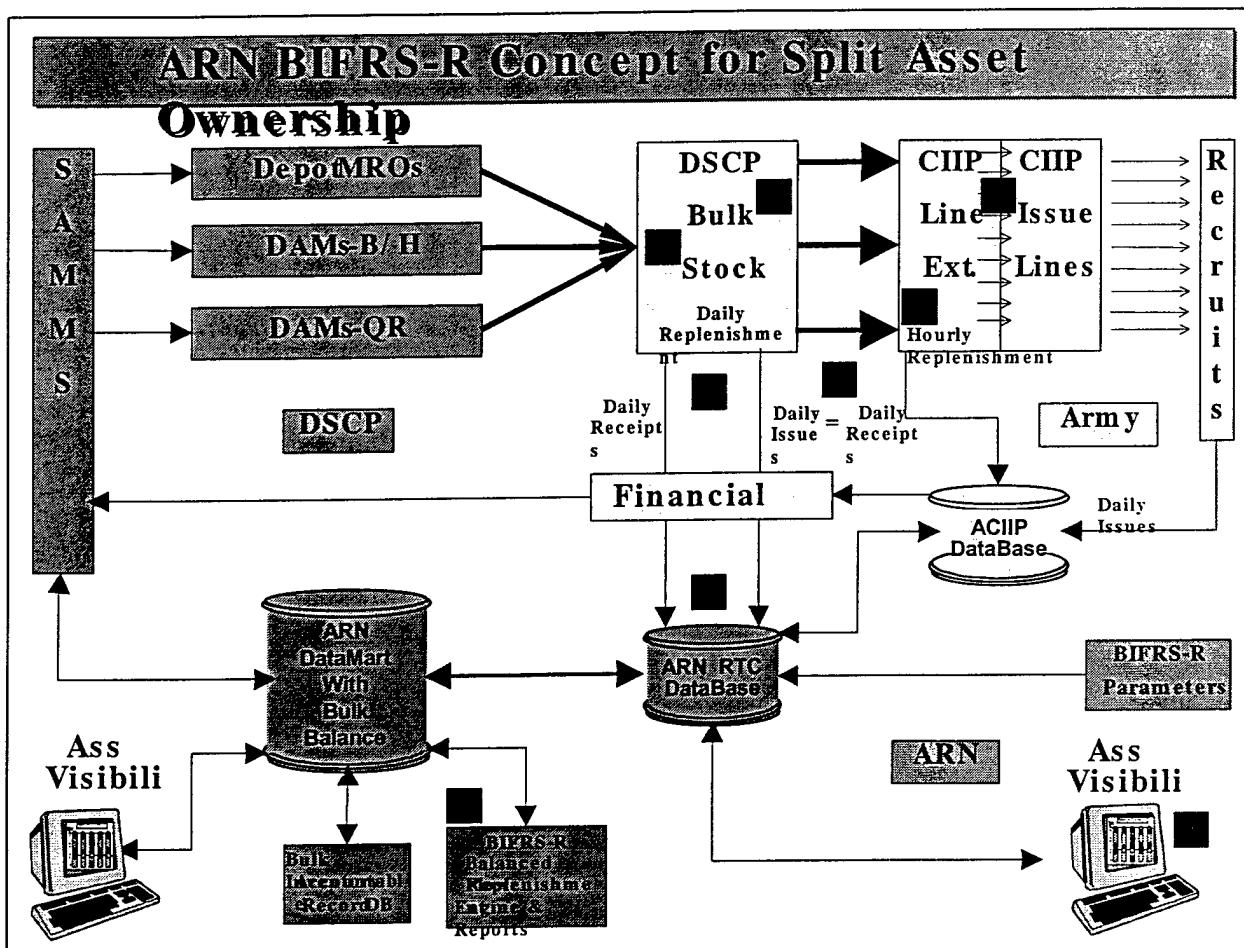
- Provides transaction registers
- Maintains due out file for soldier due outs
- Reprints soldier clothing record
- Provides on-screen help

C. Future State Operations

Following are descriptions of two feasible scenarios with the three alternatives previously described for future state operation. Each is described in sufficient detail to compare it with all others and the current state ACIIPS-R baseline operation. Again, the focus is on inventory management. The two major scenarios as previously noted are partial (bulk only) and full (bulk and issue line) inventory ownership by DSCP.

1. DSCP Owns Bulk - ACIIPS-R Enhanced with BIFRS-R

This concept is shown and discussed below. Red letter buttons are cross references from the chart to the discussion that follows.



- A. Modify Warehouse Operations. Issue lines would be expanded to contain 3 days-of-supply. Issues would take place on day 1, restocking would take place on day 2, and day 3 would be a safety level. This is required because on-hand balances in ACIIP-R would be used to push replenishment stocks forward in full case quantities as required. Sufficient space is available, but additional racks would be required and the issue line layout would not be as orderly as it is today.
- B. Establish an ARN Data Base at the RTC. This data base would receive and retain all data required to run BIFRS-R and provide total asset visibility at the RTC.
- C. Implement Scanning at the RTC. This is optional but strongly suggested to speed up bulk receiving, picking, issue line receiving, and inventorying.
- D. Implement ARN Total Asset Visibility at the RTC. This provides the same visibility to the retail item manager that the wholesale manager has through an interchange with the ARN DataMart.

- E. Implement BIFRS-R at DSCP. Implement BIFRS-R and an Accountable Records Module for the bulk inventory at DSCP. Both would run on data residing in AAVS and would be updated daily. BIFRS-R would use ACIIP-R on-hand balances to (1) generate a picking list for bulk storage in full case increments and (2) generate A2As for bulk inventory replenishment through SAMMS.
- F. Replenish the Issue Line Process. Turn off ACIIPS-R order generation and use BIFRS-R to push replenishment requirements in a balanced flow. Generate a picking list by the beginning of day 2 based on ACIIPS-R on-hand balances. Decrement on-hand balances in bulk. Pick and stage behind the issue lines early on day 2. Generate electronic AOEs for ACIIPS-R to use for funding after the picking list is completed. Use the picking list to receive replenishment at the issue lines. This is the easiest way to add an accounting function between bulk storage and the issue lines.
- G. Conduct a Semi-annual Inventory of Bulk Stocks. Follow normal inventory procedures to update accountability records at Philadelphia.

2. DSCP Owns Bulk - QLM Local

Under this scenario, with bulk stock owned and “managed” by DSCP, ACIIPS-R would be installed as planned along with QLM installed locally to support bulk inventory management and issues to the phase lines. The QLM System would track usage and provide historical review information to facilitate periodic (e.g., monthly) evaluation of phase line stockage quantities and would in-turn “push” inventory in quantities projected to be used to the phase line issue points on a scheduled basis, e.g., Mondays and Thursdays.

QLM provides numerous capabilities that would enhance support for warehousing/bulk operations including predictive forecasting incorporating replenishment planning based on projected future requirements, bar code scanning for receipts and issues.

QLM is an established and proven approach and has the ability to support other base requirements such as management of CIF inventories if desired. The current structure of the system at the Marine Corps Recruit Depot – San Diego also provides support of ARN asset visibility objectives as shown on the Inventory Draw -Down web display page.

The shortcomings of this approach include the difficulty of splitting the bulk and phase line inventories and the requirements for personnel to operate dual systems locally, i.e., QLM and ACIIP-R, to manage two different – but linked - inventories.

3. DSCP Owns Bulk - QLM Central

As in the preceding section, bulk stock would be owned and “managed” by DSCP. ACIIPS-R would be installed as planned along with a QLM installed locally to support bulk inventory management and issues to the phase lines, *and* a mirrored QLM server would be installed at DSCP. In this scenario, QLM would be used as an active local system for operational support with transactions mirrored to a remote host in DSCP.

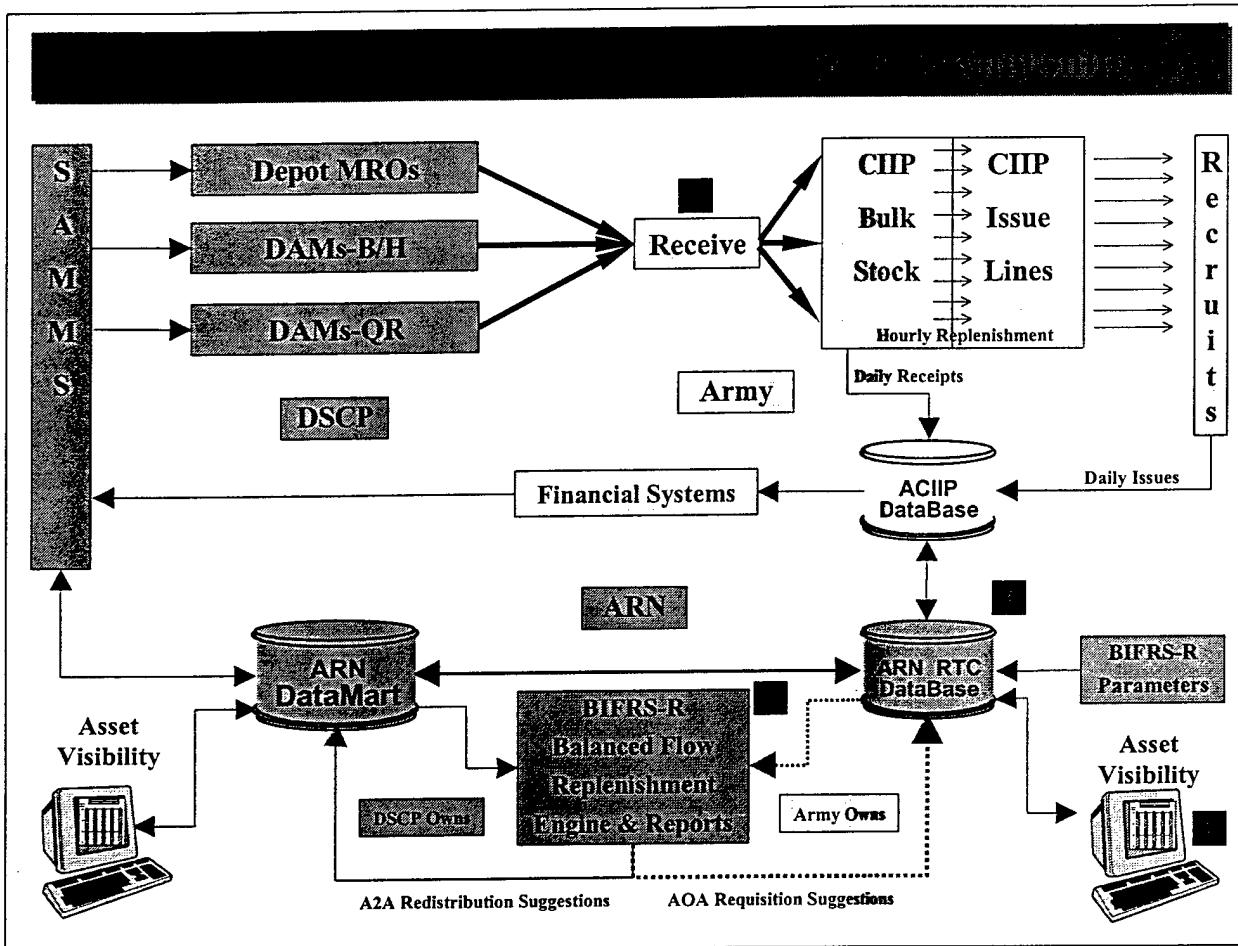
The QLM System at FLW would be used by assigned personnel to track usage and provide historical review information to facilitate periodic (e.g., monthly) evaluation of phase line stockage quantities. QLM Local would in-turn “push” inventory in quantities projected to be used to the phase line issue points on a scheduled basis, e.g., Mondays and Thursdays.

The QLM System at DSCP would be used by assigned personnel to track usage and historical information to facilitate inventory replenishment activities using QLM’s automated support features. Specifically this would include daily cycle processing at DSCP to generate suggested order requirements and these would then be reviewed and processed to SAMMS for fulfillment.

As in the preceding scenario, QLM’s local capabilities would enhance support for warehousing/bulk operations including predictive forecasting incorporating replenishment planning based on projected future requirements, bar code scanning for receipts and issues, and could be used to support CIF or other base inventories if desired.

4. DSCP Owns All -- ACIIPS-R Enhanced with BIFRS-R

This concept is shown and discussed below. Red-letter buttons are cross references from the chart to the discussion. ACIIPS-R remains in place as the accountable inventory system. This is an extremely simple and complete concept that is running at Parris Island today. There are a couple of alternate versions of this concept as shown with dotted lines. BIFRS-R and total asset visibility could be installed at the RTC to minimize inventories under RTC ownership. In this case the output of BIFRS-R would be exactly like it is at Paris Island in every respect. As a final alternative, DSCP could be given replenishment responsibility through BIFRS-R without ownership. This would also minimize stockouts and all costs with the fastest implementation.



- A. Warehouse Modifications. None.
 - B. Establish an ARN Data Base at the RTC. This data base would receive and retain all data required to run BIFRS-R and provide total asset visibility at the RTC. Identical to BIFRS-R at Parris Island.
 - C. Implement Scanning at the RTC. This is optional but would assist the receiving and inventory processes. Identical to BIFRS-R at Parris Island.
 - D. Implement ARN Total Asset Visibility at the RTC. This provides the same visibility for the retail item manager that the wholesale manager has through an interchange with ARN DataMart. Identical to BIFRS-R at Parris Island including established management reports.

- E. Implement BIFRS-R at DSCP. BIFRS-R would use ACIIP-R on-hand balances to generate A2As for bulk inventory replenishment in full case increments through SAMMS. Identical to BIFRS-R at Parris Island except A2A links with SAMMS.
- F. Replenish the Issue Lines. No changes from current practice. However, recruit issues from ACIIPS-R would be used to move money from the appropriate MPA account to the DLA stock fund account. This could be done via individual orders or roll-ups daily or weekly.

5. DSCP Owns All – QLM Local

Under this scenario, both bulk and issue line stock would be owned and “managed” by DSCP, ACIIPS-R would be installed as planned along with QLM installed locally to support bulk inventory management and issues to the phase lines. The QLM System would track usage and provide historical review information to facilitate periodic (e.g., monthly) evaluation of phase line stockage quantities and would in-turn “push” inventory in quantities projected to be used to the phase line issue points on a scheduled basis, e.g., Mondays and Thursdays.

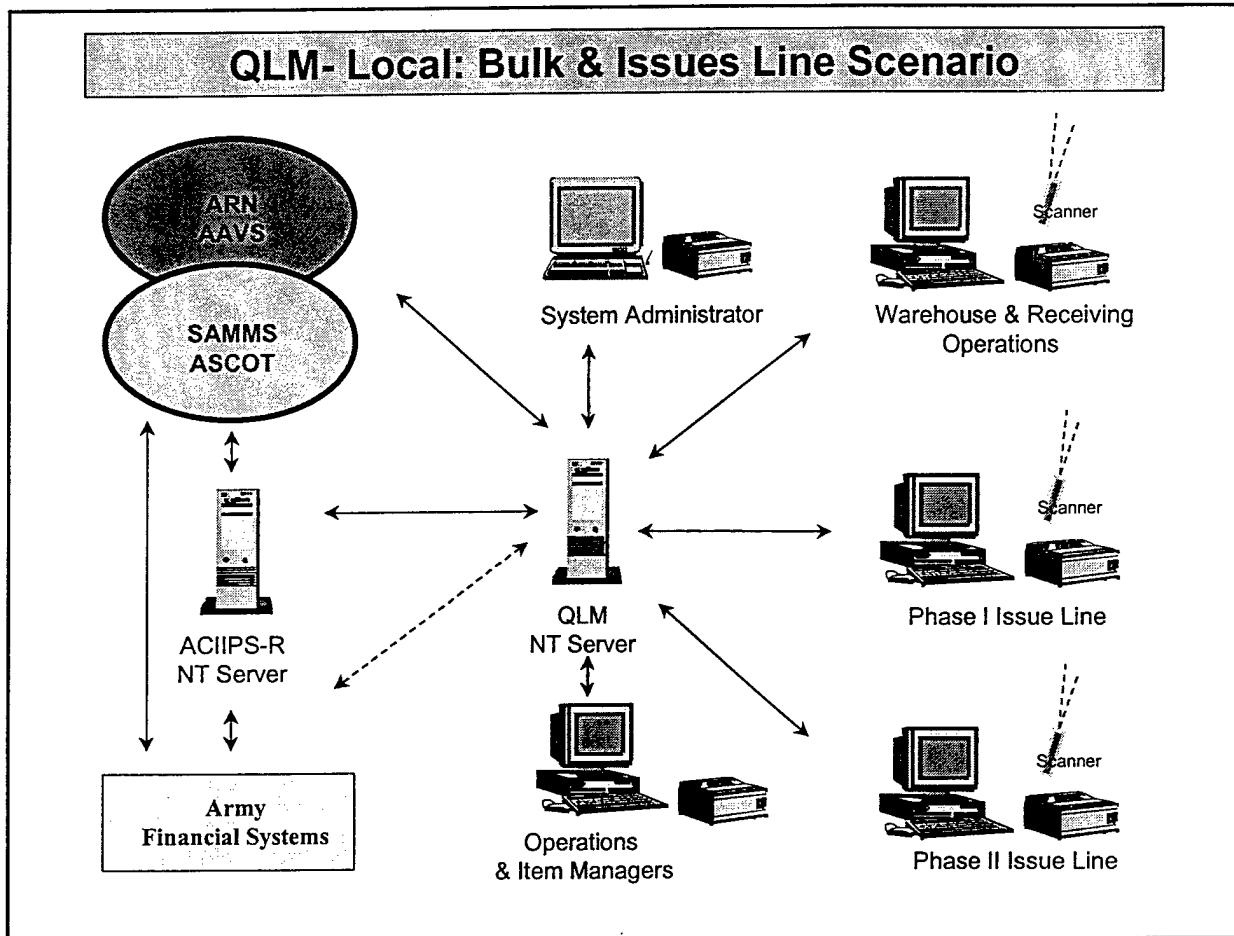
QLM in-turn would be interfaced to ACIIPS-R to provide Ft. Leonard Wood and TRADOC with reporting capabilities comparable to other DA RICs. Alternatively, since QLM can provide all of the existing required MILSTRIP transactions necessary to provide financial reporting to SARSS, it would be possible to eliminate the installation of ACIIPS-R. This would, however, require significantly more effort than provided in option 6, specifically for training, and to ensure certification and testing of interfaces between QLM and SARSS were functioning as required. As a result, the time required to implement this alternative would be likely to increase.

There would be several benefits to this approach. As in the scenario providing for only bulk inventory ownership by DDSCP, QLM’s capabilities would enhance support for both bulk and phase line inventory and issue operations. This would be through QLM providing interactive predictive forecasting capabilities incorporating replenishment planning based on projected future requirements, bar code scanning for receipts and issues, and full transaction monitoring capabilities on-line.

As in the previous scenario, with QLM installed and used fully to support logistics operations at Ft. Leonard Wood, DOL Supplies and Services could use the system to support other base requirements such as CIF inventories if desired.

The following chart shows the relative relationship of the components in this scenario/alternative. In this approach, QLM is fully installed at the Ft. Leonard Wood to support local retail operations. As at the Marine Corps demonstration site, QLM is used to provide perpetual inventory management information and to generate issues to phase

lines and requisitions and receipt information to SAMMS. This alternative approach is shown in the following diagram.



6. DSCP Owns All – QLM Central

As in the preceding section, in this scenario both bulk and issue line stock would be owned and “managed” by DSCP. ACIIPS-R would be installed as planned along and a QLM “mirrored” server would be installed locally to “reflect” the ACIIPS-R transactions to a “Host” QLM Server at DSCP. In this scenario, ACIIPS-R would be installed as planned and used as the local system for operational support with transactions mirrored through a local QLM server to a QLM host at DSCP.

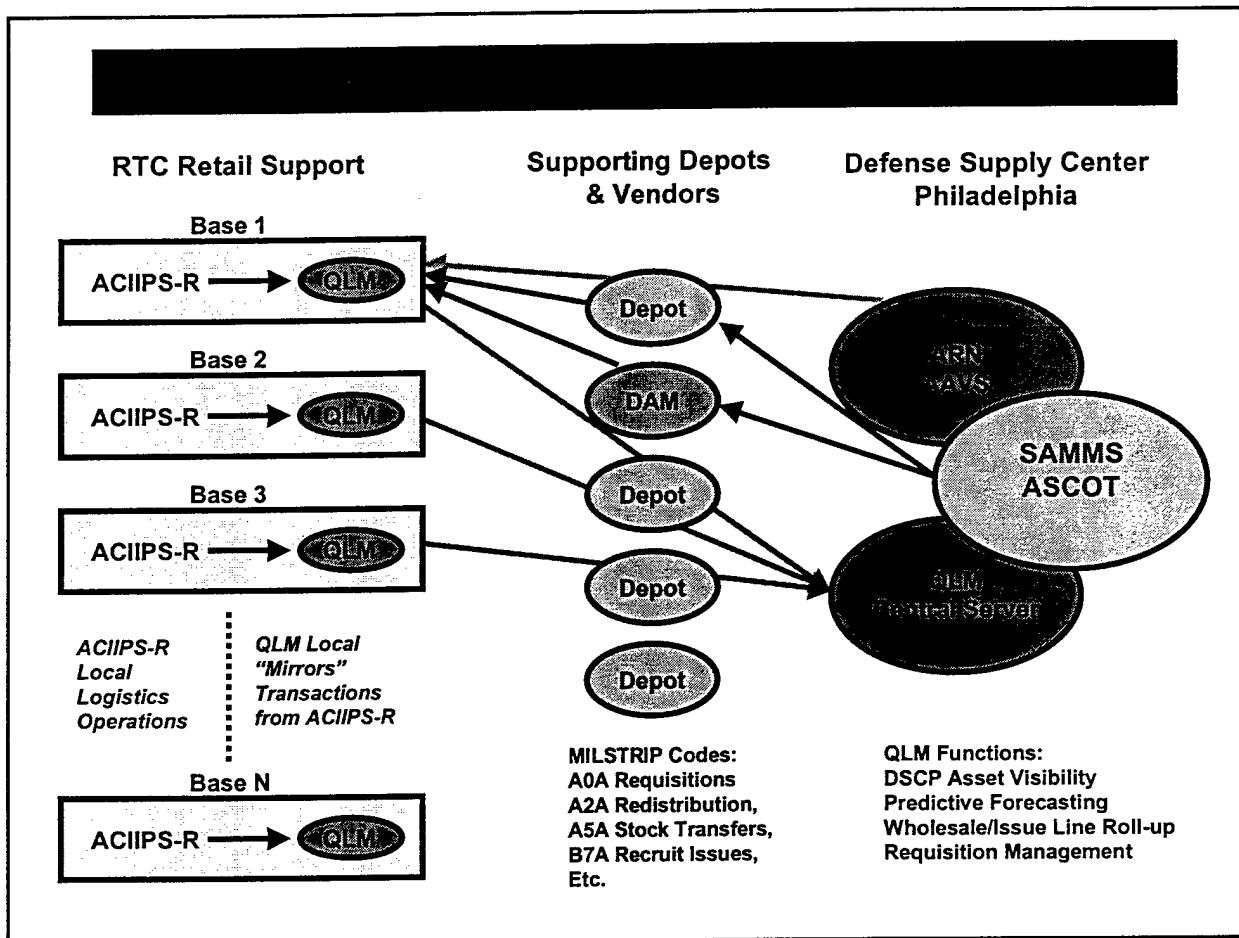
ACIIPS-R at FLW would be used by assigned personnel to track usage and provide historical and financial information as presently. QLM would be used by DSCP assigned personnel to evaluate inventory stockage levels and historical usage to meet established objectives.

As in the preceding scenario, QLM’s automated support features would be used by DSCP to generate MROs for Ft. Leonard Wood inventory replenishment through use of QLM’s suggested order capabilities. Requirements would be reviewed and approved on-line at DSCP and then processed to SAMMS for fulfillment.

This scenario provides several overall benefits in support of project objectives. These include a minimum changes in ACIIPS-R plans for Ft. Leonard Wood, rapid solution implementation, ability for asset visibility at both Ft. Leonard Wood and DSCP, and facilitation of inventory ownership transfer.

In addition, with future enhancements to QLM, users at Ft. Leonard Wood could use QLM to access current information from SAMMS via the AAVS Datamart. This would facilitate base confidence in support of operational requirements from DSCP.

The following chart shows the relative relationship of the components in this scenario/alternative. In this approach, QLM at the local retail operation is used to provide information on current SAMMS data via the AAVS capabilities and mirrors the outputs from ACIIPS-R to DSCP for assigned personnel to provide asset visibility and use in managing inventory replenishment.



IX. COMPARISON OF ALTERNATIVES

This section presents a discussion of the comparison of the various operational visions defined by the ARN Team.

A. Comparison and Evaluation Process

These comparisons took into consideration both objective and subjective criteria to the extent possible in evaluating the proposed concepts for future operations. Based on the criteria established from the objectives as previously stated, the ARN team developed a weight for each criteria assigning a value of 1 to 5 with 5 being the most desirable and 1 the least desirable. In the same manner relative values were assigned to each option criteria by criteria. Finally, option values were multiplied by criteria values and summed for each option to identify the best solution. The results are shown in the table presented at the end of this section.

B. ACIIPS and ACIIPS-R Operations (Baseline)

The first scenario was to continue present operations. The only difference in the short term is the completion of implementing the Automated (Army) Clothing Initial Issue Point System – Revised (ACIIPS-R) software and hardware. Under this scenario, Ft. Leonard Wood will continue to operate only with the ACIIPS-R capabilities once implemented. Installing ACIIPS-R with nothing else makes operational improvements over ACIIPS, but does not provide any of the necessary conditions required to meet the enterprise-wide goals and minimal total costs. These conditions are a business-like partnership, balanced flow orders and product, and total/timely inventory visibility. Also, the transfer of inventory ownership is not viable under this scenario. Each future state ARN option meets these necessary conditions.

C. Comparison of Future Scenarios

As in Section VII, the following sub-sections provide for comparison of each of the two feasible scenarios with the three alternatives previously described for future state operation. Comments on the criteria weighting are provided for each scenario/alternative to facilitate understanding the results displayed in the summary table. As previously, the focus is on inventory management and on the subjective/objective evaluation of the scenario/alternative against the criteria established.

The two major scenarios as previously noted are partial (bulk only) and full (bulk and issue line) inventory ownership by DSCP. The physical splitting of assets and the new requirements for transfer accounting make all ARN options less attractive in the split inventory ownership scenario than in the total ownership scenario. Over 95 percent of the total retail inventory is in

bulk storage and there are no obvious advantages of splitting it for two-system accountability. As a result, the ARN Team recommends DSCP give consideration to total inventory ownership at Ft. Leonard Wood. This scenario would be much easier and simpler to implement than split inventory ownership because of the physical facilities at this base.

1. ACIIPS-R Enhanced with BIFRS-R

This scenario provides for the addition of BIFRS-R (Balanced Inventory Flow Replenishment System – Retail) functionality to ACIIPS-R at DSCP. This option is very similar to the BIFRS-R operation at Parris Island. This scenario is described fully in Section VII.C.1.

2. DSCP Owns Bulk - QLM Local

This option would provide for the full installation of QLM™ (Quality Logistics Management) System at the Recruit Training Center (RTC) with interfaces to ACIIPS-R at the site. This scenario is described fully in Section VII.C.2.

3. DSCP Owns Bulk - QLM Central

This option would provide for a QLM server to be installed at the site to mirror the outputs of ACIIPS-R with a second QLM server to be installed at DSCP for operational management and support of inventory replenishment at Ft. Leonard Wood by DSCP personnel. This approach would use a “host-remote” relationship with the DSCP Server acting as the host and the remote QLM Server at Ft. Leonard Wood service as a mirrored repository of the data transactions generated by the future ACIIPS-R application operated by Ft. Leonard Wood personnel. This scenario is described fully in Section VII.C.3.

4. ACIIPS-R Enhanced with BIFRS-R

This scenario provides for the addition of BIFRS-R (Balanced Inventory Flow Replenishment System – Retail) functionality to ACIIPS-R at DSCP. This is a simple and fast alternative that is essentially identical to the current Parris Island BIFRS-R process. This scenario is described fully in Section VII.C.4.

5. DSCP Owns All – QLM Local

This option would provide for the full installation of QLM™ (Quality Logistics Management) System at the Recruit Training Center (RTC) with interfaces to ACIIPS-R at the site. This scenario is described fully in Section VII.C.5.

6. DSCP Owns All – QLM Central

This option would provide for a QLM server to be installed at the site to mirror the outputs of ACIIPS-R with a second QLM server to be installed at DSCP for operational management and support of inventory replenishment at Ft. Leonard Wood by DSCP personnel. This approach would use a “host-remote” relationship with the DSCP Server acting as the host and the remote QLM Server at Ft. Leonard Wood service as a mirrored repository of the data transactions generated by the future ACIIPS-R application operated by Ft. Leonard Wood personnel. This scenario is described fully in Section VII.C.6.

D. Weighted Alternatives Analysis Results

1. Criteria Definitions

The following definitions were used to evaluate the different scenarios/alternatives. Relative weights or scores established for each criterion are based on the ARN Team members' understanding of the desirability and impact of the individual criterion relative to the stakeholders' goals and objectives. The individual scores for each criterion in turn indicate the potential impact with a higher number providing a greater benefit, i.e., more desirable.

■ Asset Visibility –

The ability for DSCP to efficiently see all data is required to meet ARN's objective to “see” on-hand inventory data regardless of the location at the RTC. This is the core functionality required as an essential aid to decision-making.

■ Legacy Interface –

Ability of the ARN solution to work efficiently with existing external systems to meet current military department requirements.

■ **Replicability –**

Ability to “clone” results in multiple locations. This compares all aspects of roll-out beyond Ft. Leonard Wood to other bases.

■ **Time –**

The amount of calendar time required to implement the solution and show results.

■ **Current Information –**

The ability of the proposed solution to provide access to current information on an as needed (i.e., timely) basis.

■ **Improve Operational Efficiency –**

This criterion provides an estimate of the potential impact of the proposed solution to enhance the efficiency of Ft. Leonard Wood operations. This includes impacts on personnel support requirements for data collection, processing and materials handling activities.

■ **Improve Effectiveness –**

The potential impact of the proposed solution to have a favorable impact by supporting the management decision making process – both at Ft. Leonard Wood and DSCP. An example would be enabling minimum total inventory with lowest stock outs.

■ **Ft. Leonard Wood Man-hours to Implement -**

This criterion provides a weighted score based on the estimated impact on base personnel to implement the scenario/alternative.

■ **Cost –**

This is the estimated financial requirement for implementing the selected scenario/alternative. This includes only the costs related to the proposed solution at this site, and should hold for future additional sites.

■ **Total –**

This provides the sum of the relative ranking multiplied by the criterion weight.

2. Summary Comparison of Alternative Courses of Action

The following table summarizes the results of the weighted analysis of the different scenarios/alternatives.

E. Summary Recommendation

The ARN Team's recommendation is to implement the scenario providing for full ownership of both bulk and phase issue line inventory to DSCP. This scenario would be supported by use of ACIIPS-R for local support of operations locally at Ft. Leonard Wood with a QLM server installed at Ft. Leonard Wood as a "mirror" of daily transactions to a host QLM server installed at DSCP. The QLM Server at Ft. Leonard Wood would provide CIIP management with access to AAVS information including requisition status, and DSCP would use the QLM Host system to manage all inventory replenishment activities necessary to support the RIC.

(Note: This scenario is recommended for consideration for implementation at Ft. Leonard Wood because of the adverse impact on base operations - additional personnel and space and storage redesign and allocation - that would be required to physically separate and control separate ownership of bulk and issue line inventories. The physical constraints at Ft. Leonard Wood may, or may not, be encountered at other sites.)

Appendix A – Personnel Interviewed

The following individuals participated in this project and contributed information during the site visit or subsequently. The ARN Team appreciated the hospitality shared by Ft. Leonard Wood DOL and CIIP personnel during the site visit and CIIP review process.

<u>Individuals Interviewed</u>	<u>Position</u>
Jim Allen	Chief, Supply & Services Division, Directorate of Logistics
Sam Burnell	Supply & Services Division, Directorate of Logistics, Assistant to Chief
Al Carter	Item Manager, DSCP
Janet Cook	Supply & Services Division, CIIP Operations Accounting
Sally DiDonato	Manager, DSCP Recruit Dress Clothing
Jo Gregory	Supply & Services Division CIIP Data Entry Supervision
Dawn Perkins	CIIP Phase I Supervisor
Denver Williams	CIIP Manager